FEDERAL SIGNAL
Safety and Security Systems

DCB, DCFCB, and DCFCTB Models

Battery Operated
Mechanical Siren Control System

Installation, Operation, and Service Manual

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Limited Warranty

The Alerting and Notification Systems Division of **Federal Signal Corporation (Federal)** warrants each new product to be free from defects in material and workmanship, under normal use and service, for a period of two years on parts replacement and factory-performed labor (one year for Informer, EAS, and Federal software products) from the date of delivery to the first user-purchaser. Federal warrants every 2001, Eclipse and 508 Siren (Top of pole only) to be free from defects in material, per our standard warranty, under normal use and service for a period of five years on parts replacement.

During this warranty period, the obligation of Federal is limited to repairing or replacing, as Federal may elect, any part or parts of such product which after examination by Federal, are determined to be defective in material and/or workmanship.

Federal will provide warranty for any unit, which is delivered, transported prepaid, to the Federal factory or designated authorized warranty service center for examination and such examination reveals a defect in material and/or workmanship.

This warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product, or labor charges for removal and re-installation of the product. The Federal Signal Corporation warranty shall not apply to components or accessories that have a separate warranty by the original manufacturer, such as, but not limited to batteries.

Federal will provide on-site warranty service during the first 60-days after the completion of the installation, when Federal has provided a turn-key installation including optimization and/or commissioning services.

This warranty does not extend to any unit which has been subjected to abuse, misuse, improper installation or which has been inadequately maintained, nor to units which have problems related to service or modification at any facility other than the Federal factory or authorized warranty service centers. Moreover, Federal shall have no liability with respect to defects arising in Products through any cause other than ordinary use (such as, for example, accident, fire, lightning, water damage, or other remaining acts of God).

THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL FEDERAL BE LIABLE FOR ANY LOSS OF PROFITS OR ANY INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF ANY SUCH DEFECT IN MATERIAL WORKMANSHIP.

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Safety Message

⚠ WARNING

It is important to follow all instructions shipped with this product. This device is to be installed by trained personnel who are thoroughly familiar with the country electric codes and will follow these guidelines as well as local codes.

Listed below are important safety instructions and precautions you should follow:

Important Notice

Federal Signal reserves the right to make changes to devices and specifications detailed in the manual at any time in order to improve reliability, function or design. The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for any inaccuracies.

Publications

Federal Signal recommends the following publications from the Federal Emergency Management Agency for assistance with planning an outdoor warning system:

- The "Outdoor Warning Guide" (CPG 1-17)
- "Civil Preparedness, Principles of Warning" (CPG 1-14)
- FEMA-REP-1, Appendix 3 (Nuclear Plant Guideline)
- FEMA-REP-10 (Nuclear Plant Guideline).

Planning

- If suitable warning equipment is not selected, the installation site for the siren is not selected properly or the siren is not installed properly, it may not produce the intended optimum audible warning. Follow Federal Emergency Management Agency (FEMA) recommendations.
- If sirens are not activated in a timely manner when an emergency condition exists, they cannot provide the intended audible warning. It is imperative that knowledgeable people, who are provided with the necessary information, are available at all times to authorize the activation of the sirens.
- When sirens are used out of doors, people indoors may not be able to hear the warning signals. Separate warning devices or procedures may be needed to effectively warn people indoors.

- The sound output of sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren placement, post warnings, and restrict access to areas near sirens.
- Activating the sirens may not result in people taking the desired actions if those to be warned are not properly trained about the meaning of siren sounds. Siren users should follow FEMA recommendations and instruct those to be warned of correct actions to be taken.
- After installation, service, or maintenance, test the siren system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.
- If future service and operating personnel do not have these instructions to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also give a copy to anyone who is going to service or repair the siren.

Installation and Service

- Electrocution or severe personal injury can occur when performing various installation and service functions such as making electrical connections, drilling holes, or lifting equipment. Therefore only experienced electricians should install this product in accordance with national, state and any other electrical codes having jurisdiction. Perform all work under the direction of the installation or service crew safety foreman.
- The sound output of sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren placement, post warnings and restrict access to areas near the sirens. Sirens may be operated from remote control points. Whenever possible, disconnect all siren power including batteries before working near the siren.
- After installation or service, test the siren system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.
- If future service personnel do not have these warnings and all other instructions shipped with the equipment to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also, give a copy to anyone who is going to service or repair the sirens.

Operation

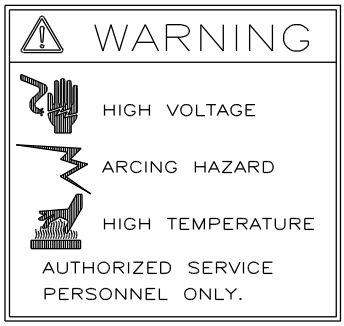
Failure to understand the capabilities and limitations of your siren system could result in permanent hearing loss, other serious injuries or death to persons too close to the sirens when you activate them or to those you need to warn. Carefully read and thoroughly understand all safety notices in this manual and all operations-related-items in all instruction manuals shipped with equipment. Thoroughly discuss all contingency plans with those responsible for warning people in your community, company, or jurisdiction.

⚠ WARNING

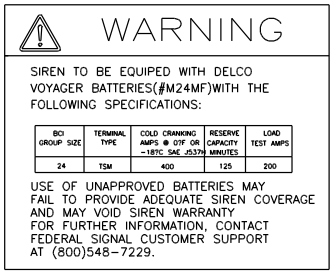
Read and understand the information contained in this manual before attempting to install or service the siren.

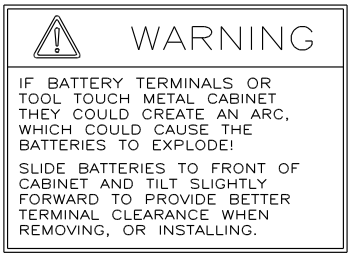
Pay careful attention to the following notices located on the equipment.

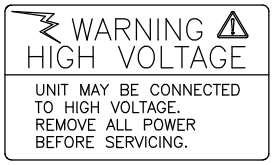
Notices—Externally Placed



Notices—Internally Placed





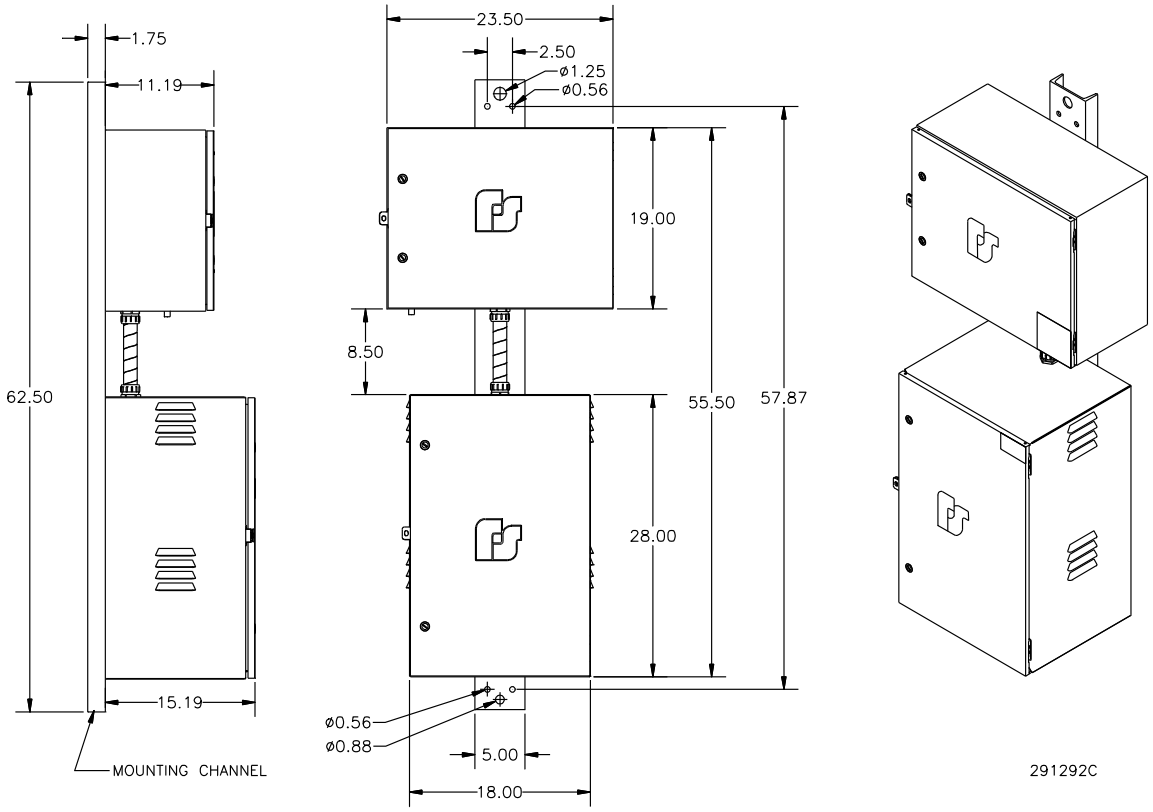


Characteristics

Scope of this Manual

This manual describes the characteristics, specifications, functional description, theory of operation, installation, and setup instructions for the controller and its sensors as well as the additional information required to operate, service, and maintain the control system.

Figure 1 DCB, DCFCB, and DCFCTB Battery and Control Cabinets



Overview

The DC Series Siren Control System contains the following components:

- Aluminum Control Cabinet and Battery Cabinet (optional 304 or 316 stainless steel cabinets)
- 48 Vdc battery charging system
- Motor Contactors
- Fusing

If required, the antenna system is not included with the radio controller models. The appropriate directional or omni-directional antenna system must be ordered separately.

DCB Model

The DCB controller includes the following:

- Control Cabinet and Battery Cabinet
- 48 Vdc charging system
- Contactors (Chopper and Rotator)
- Fusing
- DIN rail terminal block
- Battery disconnect switch
- Wiring for components

DCFCB Model

The DCFCB controller includes all the components of the DCB controller plus a FC control board that can be equipped with a one-way receiver. IP board and landline board is optional. The following lists the DCFCB part numbers:

- DCFCB—FC Controller, radio not included
- DCFCBH—FC Controller with VHF Band radio
- DCFCBU—FC Controller with UHF Band radio

For special orders contact Federal Signal. See Obtaining Service on page 66 for contact information.

DCFCTB Model

The DCFCTB controller includes all the components of the DCB controller plus additional wiring for two-way status monitoring of the DC Cabinet. The DCFCTB can be equipped with a two-way radio transceiver. IP board, landline board, and a one-way receiver are all optional. The following lists the standard DCFCTB part numbers:

- DCFCTBD—Two-way Digital FC Controller, radio not included
- DCFCTBDH—Two-way Digital FC Controller with High Band radio
- DCFCTBDU—Two-way Digital FC Controller with UHF Band radio
- DCFCTBD-IP—Two-way Digital FC Controller, IP-enabled
- DCFCTB-LL—Two-way Digital FC Controller, LL-enabled

For special orders contact Federal Signal. See Obtaining Service on page 66 for contact information.

Control/Battery System

The Control/Battery System consists of two cabinets, which are channel mounted for ease of installation (refer to Figure 1 DCB, DCFCB, and DCFCTB Battery and Control Cabinets.) The upper NEMA 4 cabinet houses the necessary electronics and controls for producing the siren signals, and the charging system for the four 12 Volt batteries.

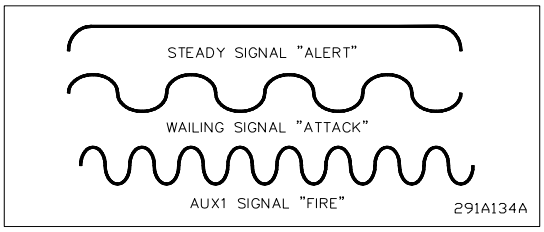
The lower vented NEMA 4X style enclosure houses four user-provided rechargeable batteries with optional lead-acid, AGM, or gel batteries. The lower and upper cabinets are interconnected through Liquid-Tight conduit, which is sealed to prevent harmful vapors from entering the control area. The four batteries are connected in series to provide 48 Vdc operating power to the siren, while the charger in the upper cabinet operates on 120 Vac to keep the batteries charged. This arrangement continues to provide power to the siren in the event of a power failure. The controller works primarily off the ac input voltage. In the event of an ac power failure, the controller automatically obtains power from a 48 V to 12 V dc-to-dc converter powered by the four 12 V batteries.

DCB and DCFCB Controller

The DCB and DCFCBs are one-way controllers. They have separately fused circuits to protect the siren controller. Two ac power fuses (F1 and F2) protect the charger and optional battery warmers respectively. The main siren motor is protected by a 200 A dc fuse. An in-line fuse connected to K1 fuses the rotator motor. The contactor coils are fused with in-line fuses. The charger output is protected with in-line fuses (refer to Figure 5 Battery Positioning and Wiring on page 53, Figure 14 DCB Wiring Diagram on page 81, and Figure 15 DCFCB Wiring Diagram on page 82.)

The Models DCB and DCFCB siren controllers are capable of producing a steady signal, wailing signal, and a fast wail or fire signal. The steady signal is frequently used as a civil defense “Alert” signal. The wailing signal is often used as a civil defense “Attack” signal. The fast wail or fire signal is often used to summon the local fire department. You can use any of the signals for any desired application. These signals are shown graphically in the following figure.

Figure 2 DCB and DCFCB Signal Characteristics



One-Way Radio Control

You can remotely activate the siren by a radio signal when an optional radio receiver/decoder is incorporated with the DCFCB System. The advantage of radio control activation is that control lines are not required between the siren control site and the siren location. For units equipped with the optional integral radio receiver, the RF Frequency configuration parameter sets the frequency of the radio channel. Changing this parameter from its factory setting requires re-alignment of the radio for maximum performance. The value entered must fall within the range specified for the receiver band equipped.

DCFCTB Controller

The DCFCTBs are two-way control and status monitoring siren controllers. The units interface to an off-the-shelf two-way radio transceiver and communicate to a base control unit through either DTMF or FSK signaling depending on the model purchased.

The controllers decode any combination of Single-Tone, Two-Tone Sequential, DTMF, EAS, POCSAG or FSK formats for activation. This makes the two-way controller compatible with virtually any existing siren control system.

The digital DCFCTBs provide the capability of digital encoding and decoding with added security. Throughout this manual, all references to digital encoding, digital decoding, and FSK features and functions pertain only to the DCFCTBD series models. You can upgrade the DTMF version of the DCFCTB to the digital version DCFCTBD with a software update. All DCFCTB models come equipped with two useable relay outputs, which can be programmed independently to activate with various codes. Relay #3 is wired as a normally closed contact and is used to force the system into battery mode during a growl test (if applicable). Relay #4 is reserved for a low voltage disconnect.

There are also four inputs and four local pushbuttons, which you can use to activate and cancel the unit.

The decode codes, relay timing and optional warning sounds are programmed into the unit through a standard RS232 serial port.

The DCFCTBs contain six user programmable functions in addition to the five preset functions: ARM, DISARM, REPORT, GROWL TEST, MASTER RESET.

The DCFCTBs come equipped with the necessary sensors and wiring to provide information on the following areas of operation:

- AC Power Status
- Communications Status
- Low Battery Voltage Indication
- Siren Activation Current
- Intrusion into Control Cabinet and Battery Cabinet
- Siren Rotation

The above information is returned in a Pass/Fail format. For example, if battery voltage is at proper operating level, then it is returned as "Battery Voltage OK." This status information is made available for viewing at the Central Control Unit. This reporting feature greatly improves warning system reliability by quickly alerting operating personnel to problems that are encountered.

The integral LCD displays Function Counters, Decoded two-tone, DTMF, POCSAG, MSK Digital functions decoded, and the current software revision. The display constantly scrolls through the display items.

Two-Way Radio Control

The Federal Signal DCFCTBs are available in VHF and UHF models transceivers to provide two-way signaling capabilities. Other radio types are available, contact Federal Signal Sales for additional information. Refer to the radio instruction manual for details concerning operation, specifications, and maintenance.

For specialized radio equipment needs, contact Federal Signal Customer Care at: 800-548-7229 or 708-534-3400 extension 5822 or Technical Support at: 800-524-3021 or 708-534-3400 extension 7329 or through e-mail at: techsupport-ans@federalsignal.com. For instruction manuals and information on related products, visit: http://www.alertnotification.net/

Specifications

Controllers Specifications

Table 1 Input Power Requirements

Input Power Requirements	
AC Voltage	120 Vac +/- 10%, 50-60 Hz, 240 Vac +/- 10%, 50-60 Hz
Current draw	4.0 A at 120 Vac (nominal) 7 Amps with HTR4 option (not available with direct 240 Vac operation)

Table 2 AC Power

2001TRB/TRBP/120246F-AC	**AC Primary Operation**
Input Voltage	208/220/240 Vac single phase
Input Current	30 A (approx.)
Output Voltage	46 Vdc/115 Vac (50 A service recommended, to be fused with 35 A Slo-Blow)
Output Current	120 A dc/10 A ac
Dimensions (H x W x D)	25.75 inches x 10.75 inches x 10.5 inches 654.05 mm x 273.05 mm x 266.7 mm
Weight	150 lb (68 kg)

Table 3 Battery Warmer

HTR4: Battery Warmers	
Input Voltage	125 Vac single phase
Power Rating	80 Watts each

Table 4 System Operating Power from the 4 Battery System

System Operating Power from the 4 Battery System	
Output Voltage	48 Vdc (nominal)
Operating Current during an activation	115 A (nominal)
Continuous Full Output Signaling Time	20 minutes (minimum)
Stand-by time on Reserve Battery Capacity that provides a full 3-minute siren activation.	5 days minimum

Table 5 Charging System

Chargers (one for all four batteries)	
Charger Output Voltage	54.0 Vdc at 100 mA
Charger Output Current	4 A maximum

Recommended Batteries (user supplied)

Refer to Federal Signal Website (http://www.alertnotification.net/) for current recommended batteries. Use of batteries other than those specified may degrade the operation of this product and void the warranty.

Table 6 Environmental

Environmental	
Operating Temperature	-30 to +65°C (with batteries maintained at -18°C minimum)

Table 7 Dimensions

Dimensions (H x W x D)	
Control Cabinet (NEMA 4)	23.5 inches x 19 inches x 11.19 inches 597 mm x 483 mm x 284 mm
Battery Cabinet (Vented NEMA 4X)	18 inches x 28 inches x 15.19 inches 457 mm x 711 mm x 386 mm
Overall (including channel)	62.5 inches x 23.5 inches x 16.94 inches 1588 mm x 597 mm x 430 mm
Total Weight (including batteries)	364 pounds (165 kg.)
Shipping Weight (excluding batteries)	300 pounds (136 kg.)

Control Board Specifications

Table 8 Input Power Requirements

AC Power	
AC supply voltage (switchable)	120 Vac +/- 10%, 50-60 Hz or 220 Vac +/- 10%, 50-60 Hz
Current draw	0.2 A max.

Table 9 Backup Battery

Backup Battery	**DC Current Draw (Nominal 48 Vdc)**
FC PCBA	150 mA Standby (without two-way radio)
Two-way Radio*	Current draw is at the following: • Standby is at 350 mA • Active/Transmit is at 8 A nominal

*Typical current draw for a radio. Refer to radio manufacturer's manual for specific ratings.

Table 10 Serial Communications

Serial Communications	
Serial Port Configuration	RS232C 1200,N,8,1

Signaling Format Specifications

Six user programmable functions in addition to the five preset functions: ARM, DISARM, REPORT, GROWL TEST, and MASTER RESET. Wildcard options for each of the DTMF strings.

Table 11 Two Tone Sequential

Frequency range	282 Hz - 3000 Hz
Tone timing	First Tone – 0.5 second minimum Second Tone – 0.25 second minimum 8 seconds maximum for both tones
Intertone Gap	400 ms (maximum)
Tone Accuracy	+/- 1.5%
Tone Spacing	5.0% preferred, 3% minimum

Table 12 Single Tone

Frequency range	282 Hz - 3000 Hz
Tone timing	0.5 second - 8 seconds maximum
Tone Accuracy	+/- 1.5%
Tone Spacing	5.0% preferred, 3% minimum

Table 13 DTMF

All timing in milliseconds	
String length	3 - 12 standard DTMF characters
Mark/Space timing:	
Decoder Minimum	50 ms/50 ms (below 50/50 consult factory)
Decoder Maximum	800 ms total mark/space timing per function
Encoder	100 ms/100 ms mark/space timing
Space between Stacked codes, minimum	1.25 seconds

Table 14 FSK

Baud rate	1200 bps
Modem type	MSK (minimal shift key)
Mark frequency	1200 Hz
Space frequency	1800 Hz
Error checking	16 bit CRC

EAS

Supports standard EAS codes and wildcards.

POCSAG

Supports Binary frequency shift keying 512 Baud numeric messages.

Inputs and Outputs

Table 15 Relay Outputs

Four relay outputs	Normally Open or Normally Closed
Contact Rating	5 A at 28 Vdc and 240 Vac

Table 16 Audio Output (Optional)

Output Voltage	>2 V peak to peak
Maximum Load	8 ohms
Total Harmonic Distortion	< 10% at 1 kHz Sine wave

Table 17 Remote Activation Inputs

Quantity	4
Input Type	Dry contact closure <1 k ohm (Requires >1 second closure)

Transceiver Specifications

Programmable Frequency, Power Out, and Private Line options are available. For further details, consult the radio owner's manual.

Functional Description

System Operating Description

Siren Activation

The DTMF versions of DCFCTBs enable the user to program an ARM string into the controller for extra security. If an arm string is not programmed, then an ARM command is not required to activate a function. Digital versions of DCFCTBs do not use the ARM function.

Activation Using the ARM function

To start siren activation through the radio, it is necessary to ARM the siren before initiating a siren function; such as, a wail or steady. Once the siren is ARMed, it remains ARMed for 255 seconds or 4.25 minutes. Upon activation of the siren, it runs until the function times out, is canceled, or is reset. If the siren function is greater than 4.25 minutes, you must send another ARM command prior to sending a CANCEL command to shut off the siren. The ARM command is not required prior to sending a RESET command.

To start a function by either landline or pushbutton, it is necessary to provide a one second closure on the landline or a one second depression of the pushbuttons.

Site Status Monitoring (DTMF only)

The siren controller reports when polled from the SS2000+/R or when one of its sensors changes state. The status of the site is encoded in a 9-digit DTMF string that is designed to work with a Federal Signal SS2000+/R to decode, format, and time and date stamp the received string. For detailed information about the DTMF coding format, refer to the Software Description of DCFCTB Encoding Format section on page 35.

Automatic Reports

The DCFCTB automatically sends back a report if one of the following sensors has a change of state: ac, Low Battery, Intrusion, Stuck Relay detected, Motor Fuse fail, or the siren is activated locally. The control station can also be set to automatically poll the system at a predefined interval. Automatic reporting may be optionally disabled on DCFCTBD systems. The DCFCTB is equipped with a carrier detect transmit hold off that causes the unit to wait until the channel is clear before an automatic report is transmitted.

The thresholds are in the following table.

Table 18 Thresholds

Input	Threshold	Time
AC fail internal	57 Vac +/- 5%	57 sec +/- 1
AC fail external TR	40 Vrms +/- 1%	2.2 sec + 1 sec x site #
Battery 12 V	12.7 V +/- 3%	20 sec
Battery 48 V	43.5 V +/- 3%	20 sec
Intrusion	Door Open	555 mS
Stuck Relay Detect	relays off & current = 50-300 A	222 mS
Motor fuse	1.0-3.4 V	5 sec
Local Activation	Pushbutton	10 sec

Growl Test

The Standard Growl Test runs the rotator for 12 seconds and the chopper motor until the sensors latch or a maximum of 2 seconds. This function is commonly used when doing periodic testing to verify proper operation while generating minimal sound.

Control Cabinet Functional Descriptions

The dc Control Cabinet has the following main parts:

- Motor Contactors
- Battery Charger
- Power Distribution and Fusing
- Radio Transceiver (optional)
- FC Controller Board (optional)

Motor Contactors

Two 200 A motor contactors are used for switching the 48 Vdc power to the siren motor through K2, and the rotator motor through K1. The contactors are controlled by the relay outputs on the DCB, DCFCB, and DCFCTB.

A third optional contactor, K3, is used to switch between the rectified 48 Vdc provided by the 240 Vac transformer option and the 48 Vdc provided by the four batteries in the battery cabinet. The switching occurs automatically when the 48 Vdc provided by the 240 Vac transformer fails.

The wiring to the siren and rotator motor is protected by a 200 A fuse.

Battery Charger

One charger is used to charge all of the batteries in the Battery Cabinet. The charger is connected to all four series connected batteries to provide 48 Vdc to the siren and rotator motors. The charger has a built-in 15 A fuse, and the charger wire is fused with a 10 A fuse within the Battery Cabinet.

Power Distribution and Fusing

The DIN rail is used to distribute and fuse various voltages. The following is a description of the terminals at the DIN rails:

Terminal	Description
TB6	
4	+48 Vdc, from Charger

TB2	
1	Ground
2	Ground
3	Ground

TB3	
1	12 Vdc from Converter
2	12 Vdc from Converter

TB4	
1	48 Vdc

TB5	
F1	10 A fuse for 120 Vac Neutral
F2	10 A fuse for 120 Vac Line
1	FUSED ac Neutral
2	FUSED ac Neutral
3	Ground
4	FUSED ac Line
5	FUSED ac Line

Radio Transceiver

When a radio transceiver is equipped, the transceiver is factory installed, programmed and aligned to work with Federal Signal DCFCTB. The 12 V transceiver is powered by the 48 V to 12 V dc-to-dc converter. The converter is powered by the four 12 V batteries that continue to run the controller in case of a power failure. Consult the radio's operating manual for further operating details.

FC Controller Board

The FC Controller Board is located on the backplane of the Control Cabinet. This board controls all functions of the DCFCB and DCFCTB. The board consists of seven main sections:

- Transceiver Interface
- Digital Inputs
- Relay Outputs
- Speaker Output
- Landline and Local Pushbuttons
- Power Inputs and Power Supply
- Encoder and Decoder Sections

FC Controller Board Indicators

The following table provides a description of LED indicators on the FC Controller Board.

Table 19 FC Controller Board Indicators

Component Number	Label	Description	Indication
D48	CPU	CPU LED	Microprocessor Heartbeat
D12	RCV	RECEIVE LED	RF Carrier Indicator on with carrier
D7	XMIT	TRANSMIT LED	Transmit
D25	ARM	RELAYS ARMED	Power to relays on
D29	D29	RELAY #1 LED	Relay #1 closed
D38	D38	RELAY #2 LED	Relay #2 closed
D39	D39	RELAY #3 LED	Relay #3 closed
D43	D43	RELAY #4 LED	Relay #4 closed, or PA mode
D15	PRES	PRESSURE LED	Pressure Sensor input
D13	INTR	INTRUSION LED	Intrusion Sensor input
D18	CUR	CURRENT LED	Current Sensor input
D14	ROT	ROTATION LED	Rotation Sensor input
D16	LOWBAT	LOW BATTERY LED	Low Battery Sensor (internal)
D17	AC FAIL	AC POWER FAIL LED	AC Power Fail Sensor (internal)
D34	POWER	POWER LED	12 V Operating Power
D53	ISO+12V	ISO 12V	Isolated 12V power
D36	ISO+5V	ISO 5V	Isolated 5V power
U16	LCD Display	LCD Display	Displays Function Counters, Decodes and Software Revision

The following tables provide descriptions of the FC Controller Board connectors, selections, and switches.

JP1	SINAD
1	Receiver module carrier detect, short to pin 2 when using SINAD board along with both sides of JP4 and remove D1
2	External transceiver carrier detect

JP2	Test Speaker
1	0 to 2 Vp-p, Audio Source: Receiver Audio during P.A. functions, Siren Audio during Electronic Siren functions
2	Ground

JP3	Short For VOX Carrier Detect
1	Short to (JP3, pin 2), for VOX carrier detect

JP4	Test Speaker
1	VCC, +5 V
2	VCC, +5 V
3	Short pins 1 and 3 to give priority to the external transceiver
4	Short pins 2 and 4 to give priority to the internal receiver. With no shorting jumper, first carrier detect has priority. Short both sides when using SINAD board along with JP1.

JP5	Sensor Inputs (#1 at left edge)
1	Pressure sensor input, dry Contact closure < 1 K
2	ISO Ground
3	Intrusion sensor input, dry Contact closure < 1 K
4	ISO Ground
5	Current sensor input, dry Contact closure < 1 K
6	ISO Ground
7	Rotation sensor input, dry Contact closure < 1 K
8	ISO Ground
9	48 Volt Battery input to 48 Volt sensor and to power supply, 15–75 Vdc
10	Ground
11	12 Volt Battery input to 12 Volt sensor and to power supply, 11–15 Vdc
12	Ground

JP6	Speaker Mute gate bypass
	Short pins 1 and 2 to bypass speaker mute gate, allow monitoring of radio channel with local speaker

JP7	Receiver Module for one-way receiver

JP8	Serial and FLASH programming Port

JP9	LEDs on with Intrusion
1	Short to pin 2, to disable LEDs when Intrusion switch is closed

JP10	Remote Activation and Sensor Inputs (#1 at left edge of connector)
1	Spare Sensor Input #2, dry Contact closure < 1 K
2	ISO Ground
3	Spare Sensor Input #1, dry Contact closure < 1 K
4	ISO Ground
5	Remote Activation Input #4, Activates Functions under code 4, dry Contact closure < 1 K
6	ISO Ground
7	Remote Activation Input #3, Activates Functions under code 3, dry Contact closure < 1 K
8	ISO Ground
9	Remote Activation Input #2, Activates Functions under code 2, dry Contact closure < 1 K
10	ISO Ground
11	Remote Activation Input #1, Activates Functions under code 1, dry Contact closure < 1 K
12	ISO Ground

JP11	Used for special applications
1 and 2	See below
3-8	Not used
9 and 10	See below (Normally Jumpered)

Options for JP11

Jumper pins 1 and 2

Table 20 2001 dc Solar mode

AC (Power)	AC power and external power or 50 Vdc (ac power or 48 V battery/charger) latching
Battery	>12.7 v (dc-dc) and >43.7 v (48 V battery)
Pressure	Motor fuse (low = pass)

Table 21 2001 dc Non-Solar mode

AC (Power)	AC power and external ac power (not looking at 48 Vdc)
Battery	>12.7 v (dc-dc) and >43.7 v (48 V battery) (either 12 or 48 fail will cause a fail) Transfer switch low voltage detect (External ac input Sense2, low=voltage pass)
Pressure	Motor fuse (low = pass)

Table 22 FCD Repeater Solar mode

AC (Power)	AC power and external power or 50 Vdc (ac power or 48 V battery/Charger) latching
Battery	12.7 Vdc (connects to 12 V battery or dc-dc convertor)
Pressure	Charger = External charger sense contact (low = pass)

Table 23 FCD Repeater Non-Solar mode

AC (Power)	AC and external power or 50 Vdc (ac power or 48 V battery/charger) latching
Battery	12.7 Vdc (connects to 12 V battery or dc-dc convertor)
Pressure	Charger = External charger sense contact (low = pass)

Jumper pins 9 and 10 for Kenwood Mode or Transformer Rectifier and Control Mode

Kenwood Mode

When the Kenwood mode is polled, the system responds over the port which received the poll request only.

Transformer Rectifier and Control Mode

Use relay number 3 to switch from Transformer Rectifier (TR) to batteries in order to conduct a battery test.

Remote ac power sense debounce fixed at 4 seconds (normally 28 seconds).

Standby:

- If low voltage occurs, JP10 on pins 11 and 12 get an open contact from the TR contactor.
- If the voltage is normal, TR gives a contact closure across JP10 on pins 11 and 12.

JP12	**SINAD**
1	Directly to processor pin #58 (ADC7)
2	Ground

JP13	CTCSS Encoder/Decoder
1	Receive audio, not dc isolated, set to 1 Vp-p with 1 kHz tone at 3 kHz deviation for wideband 1.5 kHz deviation for narrowband
2	Ground
3	+8 Volts dc, < 100 mA current
4	Decode not & PTT line, low with decode, set low by processor during transmit
5	Transmit audio, 0 to 2 Vp-p of Digital data or Tone

JP14	Force Carrier Detect
1	Short to (JP14, pin 2), to force carrier detect on
2	Ground

JP15	Short To Set Deviation
1	Short to ISO Ground (JP15, pin 2), causes unit to transmit for setting deviation
2	ISO Ground

JP16	I^2C Port

JP21	Relay Outputs, 3 A, up to 240 Vac, (#1 at left edge of connector)
1	Relay 1, Common
2	Relay 1, N.O.
3	Relay 2, Common
4	Relay 2, N.O.
5	Relay 3, Common
6	Relay 3, N.O. or N.C., depending on jumper JU1
7	Relay 4, Common
8	Relay 4, N.O. or N.C., depending on jumper JU2

JP22	AC Power Input
1 and 2	120 or 240 Vac +/- 10%, 60 Hz (Set S7)

P1	Transceiver Interface
1	Transmit audio, dc isolated, 0 to 1 Vp-p
2	Receive audio, dc isolated, 350 mVp-p to 3 Vp-p
3	PTT not, goes low (<0.65 V) during transmit
4	Ground
5	+12 Volts dc, 100 mA max, 2 A with battery
6	Carrier Detect not, set low (<0.65 V) during receive
7	No connection
8	Ground
9	Ground

TP1	Two-Tone Decoder, HighPass Filter Enable
	Goes high when processor is decoding a tone > 2100 Hz

TP2	Receive audio to Two-Tone Decoder
	Audio at last stage before two-tone comparator, 1 to 3 Vp-p

TP3	Transmit audio
	0.1 to 3 Vp-p

TP4	Receive audio from Two-Tone Decoder to processor
	Audio after two-tone comparator, square waves to processor, 0 to 5 Vp-p

TP7	Two-Tone Decoder, LowPass Filter Enable
	Goes high when processor is decoding a tone < 400 Hz

TP8	Receive audio level set
	External transceiver receive audio set to 1 Vpp using R48

TP9	RX Data
	Receive data from digital modem IC, 0 to 5 Volts

TP10	DTMF Decoder STD
	Goes low whenever a DTMF digit is being decoded

S1	Local Activation #4
	Press and hold for ½ second, Activates Functions under code 4

S2	Local Activation #1
	Press and hold for ½ second, Activates Functions under code 1

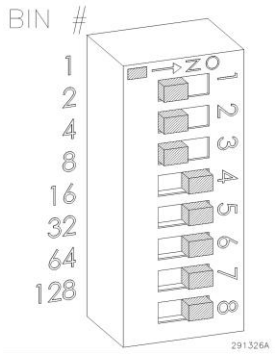
S3	Local Activation #2
	Press and hold for ½ second, Activates Functions under code 2

S4	Local Activation #3
	Press and hold for ½ second, Activates Functions under code 3

S5	**Processor Reset**
S7	**110 / 220 Vac Selector switch**
R48	**External transceiver receive audio set to 1Vpp at TP8**
R61	**Test Speaker output level set**
R70	**MSK modem transmit deviation level set**
R71	**DTMF transmit deviation level set**

S6	**Site Address Switch**
	Sets units site number

Unit Address



The unit address sets the siren site number and is used to identify the site in two-way report back systems. The unit address is a three-digit number with a range of 001-255. The unit address is set using dipswitch S1. S1 Off position indicates active position. Add binary active switch positions to get ID address.

Switch number	1	2	3	4	5	6	7	8
Binary number	1	2	4	8	16	32	64	128

Example: Switch number 1, 2 and 3 are binary numbers 1, 2 and 4, which when added would equal unit address 7.

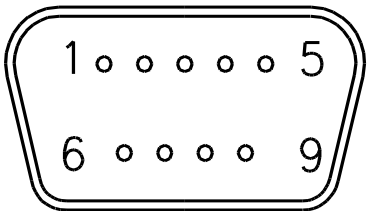
NOTE: Must be set to address one to program controller board or to program a non-digital unit. When programming is completed, change dipswitch setting to actual site address. Programming details are in the software manual. The ID address is stored at power up of the controller. If the ID address is changed, the power (battery and ac) must be turned off and then on.

Transceiver Interface

You can interface a transceiver through the male DB9 connector, P1.

Position	Description
1	Transmit Audio
2	Receive Audio
3	PTT
4	Ground
5	12 Vdc (unregulated)
6	Carrier Detect
7	Not used
8,9	Ground

Figure 3 Transceiver Interface Connector P1



Transmit Audio

You can adjust the encoded audio from 0 to 1.2 V_{p-p} (O.C.) using the DTMF Deviation Potentiometer, R71 and Digital Deviation Potentiometer, R70. Use to set the audio output level to the transceiver. You can connect the transmit audio to the radio's line level (flat) audio input or its mic (pre-emphasized) audio input, but the flat or non-pre-emphasized input is preferred and is easier to adjust. The transmit deviation is adjusted as follows:

- DTMF–Adjust R71 for 3 kHz deviation (add .75 kHz deviation if CTCSS is used)
- Digital–Adjust R70 for 3 kHz Deviation (do not exceed 4 kHz)

*__NOTE__: Deviation levels are cut in half when using 12.5 kHz channel spaced radios.

Receive Audio

Connect the receive audio to the radio's de-emphasized audio out. You can adjust the audio level of an external transceiver by R48 and when receiving a properly modulated signal as described above, adjust to 1 V_{p-p} at TP8.

PTT

Push-to-talk pulls to ground to place the transceiver into transmit mode.

+12 Vdc

The +12 Vdc is an unregulated, 1.0 A supply that can vary from 11.5–13.6 Vdc.

Carrier Detect

Carrier Detect input requires a pull to ground to indicate when carrier is present.

Sensors and Sensor Inputs

The FC Controller Board comes with the following inputs to work with external sensors and two built-in sensors to report the following conditions:

AC	JP22
AC (External Sensor Input)	JP10-1
Low Battery, 12 Vdc	JP5-11
Low Battery, 48 Vdc	JP5-9 (only used with 48 V type sirens.)
Rotation (Proximity Switch)	JP5-7
Rotation (Current Sensor)	JP10-3
Main Siren Motor Current	JP5-5
Intrusion	JP5-3

AC Sensor

During normal operation (when ac is present) the built-in ac sensor does not light. If ac is lost, the ac LED lights. The ac sensing logic is dependent on both the built-in ac sense and the external ac sense points. If an ac loss is detected at either point, a report is sent. A loss of ac is not reported immediately. The controller makes sure the loss lasts at least 2 seconds then it adds (1 second * Site #) before reporting. Each siren with an ac failure reports by site number in sequential order with a two second delay between sites. Once ac is restored, another automatic report is sent in the same order to show change of state. If ac is restored before the automatic report is sent, the report is cancelled.

Low Battery Sensor

The low battery sensor input measures the voltage across the four series batteries. If the battery voltage goes below ~44 V for 20 seconds, the controller reports a low battery condition. The controller does not automatically report when the battery voltage returns to normal to eliminate the possibility of multiple reports when a battery is very weak. The low battery condition remains latched in memory until the controller is reset or a function is run and the battery voltage is restored.

Digital Inputs for Rotation Sensor

Two rotation sensor inputs exist. Depending on the sensor option purchased, either the current sensor or proximity switch input is used.

- Standard Rotation Sensor Input: JP10-3 is used for the rotation motor current sensor. This input latches when current is detected. During a siren rotation this input is pulled low. The latch is reset by the RESET command.
- Proximity Switch Rotation Sensor Input: JP5-7 is used to connect a proximity switch to detect siren rotation. You may leave this input unconnected if a non-rotating siren is used or if JP10-3 is used to detect rotation. During a normal siren activation (when the siren is rotating), the external rotation sensor, which is usually an open collector proximity device mounted in the siren to detect gear movement, provides active low pulses. Once this input receives more than 11 low pulses during a siren activation, this input will latch active until a reset command is received.

Digital Input for Current Sensor

JP5-5 is used to detect the main siren motor operating current during siren activation. This input is pulled low when the external current sensor detects proper running current during a siren activation. If this input is pulled low for 1/4 second, the input is latched active until another activation command is received or a Reset command is sent.

Digital Input for Intrusion Sensor

JP5-3 is used to detect an intrusion into the control cabinet. With the Control Cabinet closed, the intrusion switch is in a normally closed position. If the intrusion condition changes state for more than one second, an auto-report is sent.

Digital Input for Pressure Sensor (not used with 2001-130 sirens)

JP5-1 is used to detect blower pressure on Thunderbolt sirens during siren activation. This sensor input latches when operating current is detected (input is pulled low) and resets when a RESET command is received.

Relay Outputs

JP21	
Pin	**Out**
1	Relay 1, Common
2	Relay 1, N.O.
3	Relay 2, Common
4	Relay 2, N.O.
5	Relay 3, Common
6	Relay 3, N.O. or N.C., depending on jumper JU1, (N.C. is standard)
7	Relay 4, Common
8	Relay 4, N.O. or N.C., depending on jumper JU2, (N.O. is standard)

There are four relay outputs on the FC Controller Board, which are controlled by the microprocessor. The relays provide isolation and are spike protected to prevent voltage spikes from affecting the unit. As the relay coil is energized, the outputs close and the associated LED lights. The FC Controller Board comes standard with two DPST relays. Relay #3 is reserved for testing the system while using batteries. Relay #4 is reserved for the low voltage cutoff feature.

Speaker Output

You can use the speaker output at JP2 to monitor received audio, route remote P.A. or provide signal out when the tone generator option is used. You can adjust speaker output up 2.0 V_{p-p} into an 8-Ohm load using R61.

Monitor Received Audio

When carrier is present, the received audio is routed to the test speaker output at JP2.

Remote Public Address

You need to program the P.A. as a function through the software if it is to be used. When the P.A. function is activated, the FC Controller Board routes the received audio to the speaker output as long as carrier is detected. If the carrier drops out for more than 15 seconds, the unit goes back to standby mode.

Audio Function Generator Option

To use this feature, you need to program one of the standard signals or a custom signal through the software. When the audio function is activated, the audio from the function generator is routed to the speaker output until the function finishes or a cancel code is sent.

Landline and Local Pushbutton Activation

You can activate the first four pre-programmed functions locally through the pushbuttons, on the FC Controller Board, or remotely by grounding one of the landline activation inputs at JP10 for at least one second. The remote inputs are protected by limiting diodes and cannot exceed 5.1 Volt. Each pushbutton is labeled with its associated function.

The remote inputs on JP10 are identified as follows:

JP10	Pin-out
Pin #1	EXTERNAL AC SENSOR INPUT
Pin #2	common
Pin #3	ROTATOR CURRENT SENSOR INPUT
Pin #4	common
Pin #5	FUNCTION #4
Pin #6	common
Pin #7	FUNCTION #3
Pin #8	common
Pin #9	FUNCTION #2
Pin #10	common
Pin #11	FUNCTION #1
Pin #12	common

Control Board Power Input

The FC Controller Board has a switch selectable nominal 115/240 Vac power input. When the proper voltage is applied, the POWER LED is lit. Set S7 to the appropriate voltage input level. Verify charger is also set accordingly. Refer to the Installation section on page 44 for installation details.

DTMF Decoding and Encoding Formats

Decoding Format

DTMF

The FC Controller Board decodes any valid 3 to 12 digit DTMF string with timing of 50/50 to a total mark/space time of 800 milliseconds. Faster DTMF decode timing, down to 35/5 ms, is available but you need to specify when ordered. When stacking multiple DTMF strings together, a 1250 millisecond spacing is needed before and after a valid DTMF string for proper decoding. Otherwise, the decoder disregards the string.

Two-Tone

The FC Controller Board decodes two-tone codes with tone accuracy within 1.5%. Timing must be at least 80% of what has been programmed. The inter tone gap must be less than 400 milliseconds. The recommended minimum tone spacing is 5%. You

can use tone timings between 0.5 seconds and 8 seconds for the A tone and between 0.25 seconds and 8 seconds for the B tone.

DTMF Encoding Format

The FC Controller Board encodes a 9 digit DTMF string that includes the RTU's unit type, ID number, function status, and sensors status. Refer to the Software Description of DCFCTB Encoding Format section on page 35 for detailed information.

Technical Description

Control Board Theory of Operation

Description of DCFCTB Block Diagram

Power Supply Section

The DC Cabinets can be powered from nominal 240 Vac, 120 Vac, or 48 Vdc. Various options and configurations are available. The following describes typical configurations and operation.

A DC Cabinet configuration can be powered from a 240 Vac, which is then stepped down to 120 Vac and 48 Vdc (through a transformer). This type of configuration allows the DC Cabinet to use the 48 Vdc to power the sirens, as long as the 240 Vac is present at the transformer. If 240 Vac is lost (therefore so is the 48 Vdc from the transformer), the DC Cabinet transfers a relay, which causes the battery system to power the sirens. In this configuration, the 120 Vac is brought into the cabinet and is used to power the FC control board (if equipped) the battery charging system, and the battery heater (if equipped).

A DC Cabinet can also be powered with nominal 240 Vac directly (that is, without a transformer). In this configuration the 240 Vac powers the FC control board and the battery charger. Battery heaters are not allowed with this configuration. During siren activation, the batteries power the FC control board and the siren.

CPU Section

The CPU section is comprised of a microprocessor with a watchdog timer, a day/date clock, non-volatile EEPROM and FLASH memory, I/O pins and A to D convertors. The EEPROM is the non-volatile memory where all customer specific information held while the FLASH is the non-volatile memory where the main program is held.

The unit contains an eight-position dipswitch for setting the unit's site address.

Remote Activation, Sensor, and Battery Back-up Voltage Input Section

The remote activation inputs are available on connector JP10. Grounding any one of these pins activates the function associated with it. The inputs are protected by

limiting diodes and optically isolated. There is also a pushbutton on the board for each of these functions that activate the associated input.

The sensor inputs are available on connectors JP10 and JP5.

Rotation, Intrusion, Pressure, Current, and Spare sensor inputs #1 and #2 are all active low (shorting to isolated ground). When one of these inputs is shorted to isolated ground the output of the associated optical-isolator pulls low.

For an External Transceiver

The receive audio, from P1 pin 2 (the two-way connector) is routed to the output which is set to 1 V_{p-p} at TP8 using R48.

Receiver Priority

Jumper JP4 sets the priority if an external transceiver and an on-board receiver are both used. The receiver with priority can interrupt the other receiver and its audio passes through to the rest of the circuits in the controller. The receiver with priority cannot be interrupted. If neither receiver is given priority then whichever receiver asserts carrier detect first will pass through and the other receiver will not be able to interrupt it.

If the “EXT” side is jumpered then the external transceiver has priority.

If the “INT” side is jumpered then the on-board receiver has priority.

If both sides of JP4 are jumpered then the two receive audio signals are mixed together. This is done if the SINAD option is used as it allows receive audio from the external transceiver jack to pass through to the on-board receiver connector to feed the SINAD option board. JP1 must also be jumpered when the SINAD option is installed.

VOX

JP3 which can be jumpered to provide VOX carrier detect for radios that do not provide carrier detect.

POCSAG Decode

All POCSAG messages contain a Receiver Identity Code (RIC) or CAP code. This indicates which unit or group of units a message is intended for. The unit must have its RIC configured before it responds to a message.

The Standard Format for Federal Signal POSAG codes consists of a 5 character numeric message preceded by a bracket “[” and followed by a bracket “]” for a total of 7 characters. The first 3 numbers are the unit number. Any unit number less than 300 activates only that unit number. A unit number of 300 activates all units. Unit number of 301 to 316 activates all units in zones 1 to zone 16 respectively. The unit must be configured for the zone in which it is to function.

The last two numbers in the message are the function number (01 through 06), which activates functions 1 through 6. Function numbers 96, 97, 98 and 99 activate Poll All, Reset, Quiet Test, or Cancel respectively.

Relay Outputs Section

There are 4 relay outputs that are controlled by the processor. They are driven through an opto-isolator and protected to prevent voltage spikes from affecting the unit. The outputs appear on a connector at the bottom of the board and are all normally open with contact ratings up to 5 A and 240 Volts ac RMS. K3 and K4 outputs have selectable N.O. or N.C. contacts.

Speaker Output Section

The CPU generates warning sounds, which are routed to the speaker output JP2.

Software Description of DCFCTB Encoding Format

The FC Controller Board encodes a 9 digit DTMF string that includes the RTU's unit type, ID number, function status and sensors status.

Digit #	Description
1	Start Character, always a DTMF "*"
2	Unit type programmed into unit (see unit types)
3	Function status (see function currently running)
4	unit number: BCD most significant digit
5	unit number: BCD middle digit
6	unit number: BCD least significant digit
7	BCD of sensor status: (see decoding of sensor status)
8	BCD of sensor status: (see decoding of sensor status)
9	Terminating Character "*"

Table 24 Conversion of DTMF Digit to BCD

DTMF Character	BCD equivalent
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
0	1 0 1 0
*	1 0 1 1
#	1 1 0 0
A	1 1 0 1
B	1 1 1 0
C	1 1 1 1
D	0 0 0 0

Table 25 Unit Types

DTMF Character	DCFCTB types
A	Single motor mechanical
B	Three motor mechanical
C	2001AC or DCB

Table 26 Function currently running

DTMF Character	Function
0	Standby
1	Function 1
2	Function 2
3	Function 3
4	Function 4
5	Function 5
6	Function 6

Decoding sensor status

Sensor status decoding using the DTMF digit to BCD reports current sensor status. Depending on the type of unit selected the sensors required vary.

Table 27 Digit 7

Digit 7	DCB or 2001AC	Single Motor Siren	Three Motor Siren
Bit 1 (LSB)	Rotation	N/A	Rotation
Bit 2	Intrusion	Intrusion	Intrusion
Bit 3	Not used, always 0	Not used, always 0	Not used, always 0
Bit 4	AC power	AC power	AC power

Table 28 Digit 8

Digit 8	DCB or 2001AC	Single Motor Siren	Three Motor Siren
Bit 1	Battery voltage*	Battery voltage*	Battery voltage*
Bit 2	AUX 1	AUX 1	Blower motor
Bit 3	Activation current	Activation current	Activation current
Bit 4	Local activation	Local activation	Local activation

* Battery voltage refers to the 48 V siren voltage.

Table 29 Bit Status

0	1
Rotation did occur	Rotation did not occur
Cabinet door is closed	Cabinet door is open
AC power is ON	AC power is OFF
AUX 1 closed	AUX 1 open
Blower did operate	Blower did not operate
Activation current detected	Activation current not detected
Battery voltage okay	Battery voltage low
Local activation occurred	Local activation did not occur

Example

Received DTMF report string *** C 1 D D 2 05 ***

*	Starting character
C	Unit type DCFCTB with 2001 siren
1	Currently running function 1
DD2	Siren site number (0000) (0000) (0010), which equals site number 002

0	Sensor status is (0000),	Bit 1 is 0, rotation occurred
		Bit 2 is 0, cabinet door is open
		Bit 3 is 0, not used, always 0
		Bit 4 is 0, ac power is on
5	Sensor status is (0101),	Bit 1 is 1, battery voltage is low
		Bit 2 is 0, AUX 1 is closed
		Bit 3 is 1, activation current not detected
		Bit 4 is 0, local activation occurred

Chopper Motor Current Sensor Theory of Operation

Overview

The adjustable current sensor 2001062B is a window comparator device that uses a current sensor and window comparator. The output is opto-coupled and the circuit is powered by a voltage regulator. The ground for the circuit is selected by way of jumper J2 between isolated or earth ground. The operation of the circuit is such that if the current passing through the probe of the current sensor is larger than the lower preset level and is less than the upper preset level, an active high output results turning on the opto-coupled output, indicating that the sensed current is within the acceptable range.

Circuit Description

The circuit is energized when 12 Vdc (nominal) is applied to J1-3 and ground is applied to J1-1. The 12 Vdc at J1-3 is applied directly to the voltage regulator. The regulated 8 Vdc output of IC1 is applied to the dual op amp at pin 8 and also to the Hall-Effect current sensor at its (+) input.

Current probe CS1 is designed to generate a reference voltage of 1/2 the supply voltage on its (0) output pin. With 8.0 Vdc at the (+) input of CS1 and ground applied at the (-) input of CS1, CS1 outputs 4.0 Vdc on the (0) output when the current passing through the probe of CS1 is zero. This voltage is applied to R2, through which C4 is charged to 4.0 Volts, and this voltage is applied to the non-inverting input of IC2B and the inverting input of IC2A. The output of the current sensor is linearly scaled such that a change of 100 A in sensed current results in a change of 1.0 Volt at the output, and a change of 1.0 A results in a change of 0.01 Volts at the output. Using this calibration, POT1 and POT2 can be adjusted to set upper and lower current thresholds, respectively.

A typical application of the current sensor could be to set the device for an upper current threshold of 300 A, and a lower current threshold of 50 A. Using these values, the voltage at TP1 corresponding to 150 A is the following:

4.0V + (300A * 0.01V/A) = 7V

The voltage at TP1 corresponding to 70 A is the following:

4.0V + (50A * 0.01V/A) = 4.5V

Adjusting POT1 sets the upper current threshold voltage of 7 V at TP2, and adjusting POT2 sets the lower current threshold voltage of 4.5 V at TP4. With a sensed current value between 50 and 300 A, the voltage at TP1 is between 4.5 and 7 Volts. Since the voltage at the inverting input of IC2B (pin 6, also TP2) is set to 7 Volts, and the voltage at the non-inverting input (pin 5) is less than 7 Volts, the output of IC2B (pin 7) is logic low. Similarly, since the voltage at the non-inverting input of IC2A (pin3, also TP4) is set to 4.5 Volts, and the voltage at the inverting input (pin 2) is greater than 4.5 Volts, the output of IC2A (pin 1) is also logic low.

The outputs of IC2A and IC2B are applied directly to the inputs of NOR gate IC3. With a logic low at both inputs of IC3 (pins 1 and 2), the output of IC3 at pin 3 is a logic high, approximately 8 Volts. 8 Volts applied through R1 to the input (pin 1) of opto-coupler IC4 causes the output transistor of IC4 to be saturated and a logic low is applied to J1-2, indicating that the sensed current is within the preset acceptable range.

In the case that the sensed current exceeds the upper current limit, the voltage at TP1 is larger than 7 Volts, putting the non-inverting input of IC2B at a higher potential than the inverting input, resulting in a logic high at the output of IC2B, which is applied to pin 1 of IC3. A logic high at either or both inputs of IC3 yields a logic low at the output of IC3, which causes the output transistor of IC4 to be cut off and a logic high is applied to J1-2, indicating that the sensed current is outside the acceptable range. J2-1 must be pulled high by whatever circuit it is

connected to. In similar fashion, if the sensed current falls below the lower current limit, the voltage at TP1 is less than 4.5 Volts, putting the inverting input at a lower potential than the non-inverting input, resulting in a logic high at the output of IC2A, which is applied to pin 2 of NOR gate IC3. As described above, this results in an active high applied to J1-2, indicating that the sensed current is outside the acceptable range.

Rotator Motor Current Sensor Theory of Operation

Overview

The Current Sensor board, 2005221 Rev B, is mounted on the backplane under the dc contactors. It monitors the dc current of the rotator motor. It scales the voltage reading to allow direct reading of the current passing through the sensor and employs a window comparator which signals that the current is between a lower and an upper limit.

Features

- Easy direct reading of current passing through the sensor
- Fixed window comparator, no adjustment needed
- Accurate to +/- 5%

Electrical Specifications for Rotator Motor Current Sensor

Table 30 Electrical Specifications for Rotator Motor Current Sensor

Input Voltage	7 Vdc – 30 Vdc
Input Current	<30 mA maximum
Measurement Current Ranges	0 to 5 A, 0 to 5 Vdc at TP3
	0 to 15 A, 0 to 5 Vdc at TP3
Window Comparator Thresholds	JP3 and JP4 not jumpered
	0.34 Vdc min., 1.50 Vdc max.
	(0.34 and 1.5 A)
	JP3 and JP4 jumpered
	1.00 Vdc min., 2.67 Vdc max.
	(3.0 and 8 A)
Window Comparator Output	Open collector, sink </= 500 mA

Connectors

JP1	Current Measurement Pass-Through
1	(+) voltage source
2	0-5 A (for gear driven rotators) output to motor, (-)
3	0-15 A (for belt driven rotators) output to motor, (-)

JP2	Interface, Power In and Signal Output
1	Ground
2	Window comparator output, open collector, pulls low when current is above minimum and below maximum current
3	DC supply voltage input (7 Vdc to 30 Vdc)
4	Analog sensor output. 0 – 5 Vdc for 0 - 5 A input
	0 – 5 Vdc for 0 - 15 A input

JP3 and JP4	Jumper headers
	Shorted to set window comparator thresholds for belt driven rotators

Circuit Description

Power Supply

Power enters through D1, is regulated down to 5 Vdc.

Current Measurement Path

The current sensor, outputs a fixed dc voltage (2.5 V) plus a variable voltage representing the current being measured. For the 0-5 A input a 2 A current draw would = 2.5 Vdc + 0.625 Vdc or 3.125 Vdc.

The circuit generates an offset voltage. This voltage is summed with the voltage from the current sensor. This subtracts off the 2.5 Vdc from the current sensor leaving only the voltage representing the current being measured. The circuit multiplies this voltage and scales it so that 1 A of current being measured = 1 Vdc at TP3 (3 A = 1 Vdc for the 0 - 15 A input).

Battery Charger Theory of Operation

Overview

The charger features a switch mode voltage/current regulator to improve efficiency and reduce heat. The charger incorporates a three-stage charge algorithm to charge four series 12 Volt batteries without gassing and maintain the batteries at the optimum charge level.

The charger delivers a constant 2 A trickle charge until the batteries reach 40 Volts. The charger then raises the charge voltage until the charge current increases to 4 A. This is the bulk charge. This is maintained until the batteries' voltage reaches the float voltage of 54 Volts. The float voltage is temperature compensated to prevent over charging the batteries during hot conditions.

The charger also incorporates a temperature sensor that limits the charge current to 2 A if the ambient temperature of the charger reaches 105° C.

The charger monitors for faults. If the charger has ac power and is producing charge voltage, and, if no fault is detected, the charge status output is on. If the charger is in trickle or bulk mode and the charge current is low (not charging) a fault is detected. If the battery voltage is at least ½ Volt lower than the charger voltage (blown fuse) a fault is detected. If the charge voltage is too high (charger regulation failure) a fault is detected. If a fault is detected the FAULT LED lights and the charge status output is off.

Electrical Specifications for Battery Charger

Table 31 Electrical Specifications for Battery Charger

AC Power	108 – 132 Vac, 120 Vac nominal, 2.4 A nom. 216 – 264 Vac, 240 Vac nominal, 1.3 A nom.
Bulk Charge Current, IBULK	4 A, +/- 10% at 25°C
Float Charge Voltage	V_{FLOAT} Jumper Selectable from 52.8 to 55.2 V, +/- 0.75%
Trickle Charge Current	2.0 A, +/- 20%

Connectors

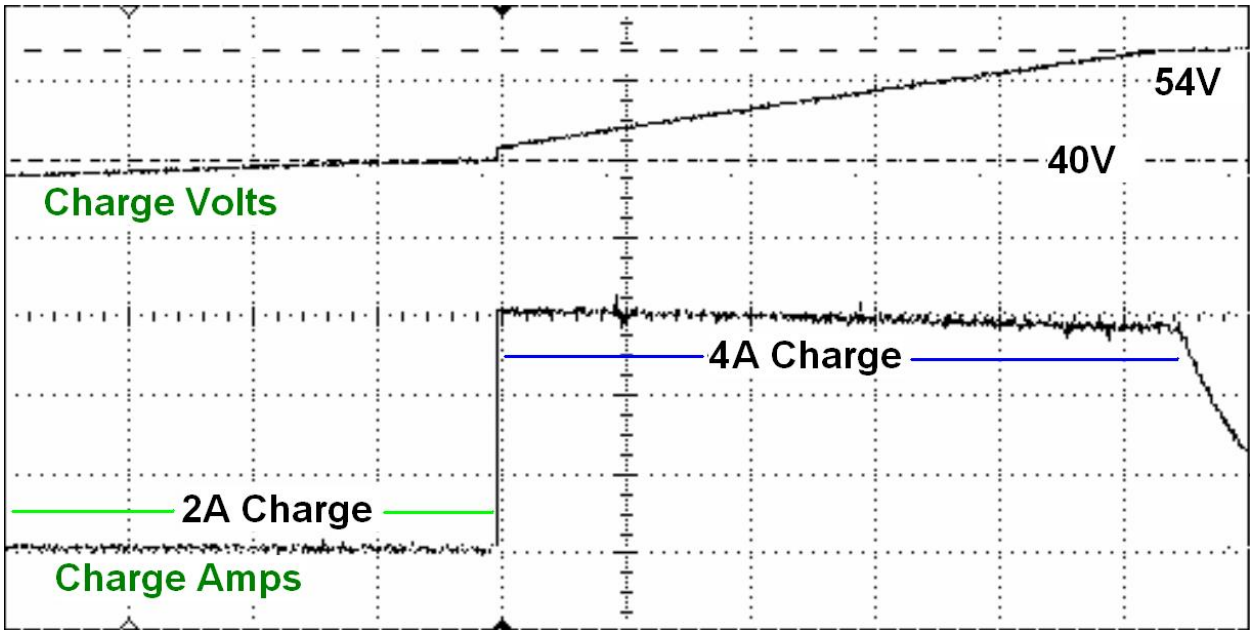
JP7	**Select the float voltage for batteries**
Jumper pins 1 and 2	13.2 V
Jumper pins 3 and 4	13.3 V
Jumper pins 5 and 6	13.4 V
Jumper pins 7 and 8	13.5 V – Default Position
Jumper pins 9 and 10	13.6 V
Jumper pins 11 and 12	13.7 V
Jumper pins 13 and 14	13.8 V

The ac power enters through fuses F1 and F2 .
These are FS# 148186-02, BUSSMAN # GDC-5A, 5 A, 250 Vac, 5 x 20 mm fuses with cULus, IMQ, MITI/JET approvals.

The power from the charger to the batteries passes out through F3.
This is FS# 148A142A-06, LITTLE FUSE # 287015, 15 A, 32V, Blade ATO/ATC automotive fuse.

Circuit Description

The charger implements a three-stage charging algorithm. The three stages are trickle charge, bulk charge, and float charge. The stages operate as follows.



Trickle Charge

In the trickle charge state, the charger supplies a steady 2 A current to the batteries until they reach 40 Volts. The purpose behind trickle charging is to prevent a potentially hazardous condition caused by continuously pumping bulk charge current into a damaged battery. Too heavy a charge when a battery is in this severely discharged state can cause gassing which is corrosive, explosive, and shortens the life of the battery. When the batteries reach 40 Volts the charger enters the bulk charge state.

Bulk Charge

In the bulk charge state, the charger sets the charge voltage to 60 Volts and limits the charge current to 4 A. When the voltage has reached 99% Vfloat, the charger switches to the float charge state.

Float Charge

In the float charge state, the charger sets the charge voltage to the selected float voltage (adjusting for battery temperature). While in the float state, the charger supplies up to 7.35 A to a load and the battery. The charger remains in the float charge state until the voltage of the batteries drops below 90% Vfloat at which time it switches back to the bulk charge state.

Current Limiter

The circuit monitors the current output of the charger by watching the voltage develop and limits the current to 4 A. If the voltage is less than 40 Volts, the circuit changes the current limit to 2 A.

Thermal Limiter

A circuit monitors the temperature of the PC board. If the temperature exceeds 105°C, the circuit changes the current limit to 2 A. This helps prevent the charger from overheating.

Charge Voltage Temperature Compensation

A thermostat monitors the temperature of the batteries. Its resistance changes with temperature.

This circuit adjusts the output charge voltage reducing it during hot conditions to prevent the batteries from being overcharged. The output charge voltage is listed in the following table.

Table 32 Output charge voltage

54.00 V =/< 30°C
53.56 V at 31°C
53.48 V at 32°C
53.44 V at 33°C
53.36 V at 34°C
53.28 V =/> 35°C

Fault Detection

If the output voltage is less than 10 V, this indicates that the regulator may have failed.

The charger's output current is monitored. If the charge current drops below ½ A, the circuit allows it only if the charger is in trickle or bulk mode. The result being that, if the charger is in trickle or bulk mode and there is little or no charge current, indicating that the regulator may have failed and that the batteries are being under-charged, a fault condition is indicated.

The circuit monitors the output voltage of the charger and the battery voltage on either side of the fuse. If the battery voltage is ½ Volt or more less than the charger output voltage, indicating a blown fuse, a fault condition is indicated.

The circuit monitors the output charge voltage. If it exceeds 2.3 Volts per cell, indicating that the regulator may have failed and that the batteries are being overcharged, a fault condition is indicated.

Fault conditions are indicated with a fault indicator light on the board.

Programming Software

FSPWARE

FSPWARE is a Microsoft Windows® based programming software for two-tone and DTMF controlled systems. This software requires a direct connection between the siren and the computer's RS232 port through the use of a PCB universal cable adaptor.

The Commander™ Digital System Software (SFCDWARE)

SFCDWARE™ software is a Microsoft Windows® based program used to control, monitor and configure the digital version of the siren controller. The software communicates with the siren controller over an RS232 port. Refer to the Help menu provided with the software for operational details.

Installation

⚠ DANGER

Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, experienced electricians in accordance with national and local electrical codes, acting under the direction of the installation crew safety foreman, should perform installation.

Explosive gases and corrosive materials may be present. To prevent explosion or severe personal injury, installation technicians must be experienced with the safe installation of lead-acid type batteries.

Recommendations on Control/Battery System Location

First consider the siren location and method of activation before determining Control/Battery System location. You can activate the DCFCB and DCFCTB system remotely through radio or landline controls and locally using pushbuttons provided in the Control Cabinet. Refer to the Landline Control section on page 53 for additional information on remote activation using landline controls.

Since the controls are in a NEMA 4 rated enclosure and the batteries are protected, you may install the controls indoors or outdoors. If you install indoors, ensure adequate ventilation is provided for the four lead acid batteries to prevent build-up of explosive gas.

To ensure proper siren power is maintained, it is recommended that the Control/Battery System location be within a 50 feet wire run to the siren. If it is necessary to make a longer run, use a 1 AWG or larger wire for the siren motor.

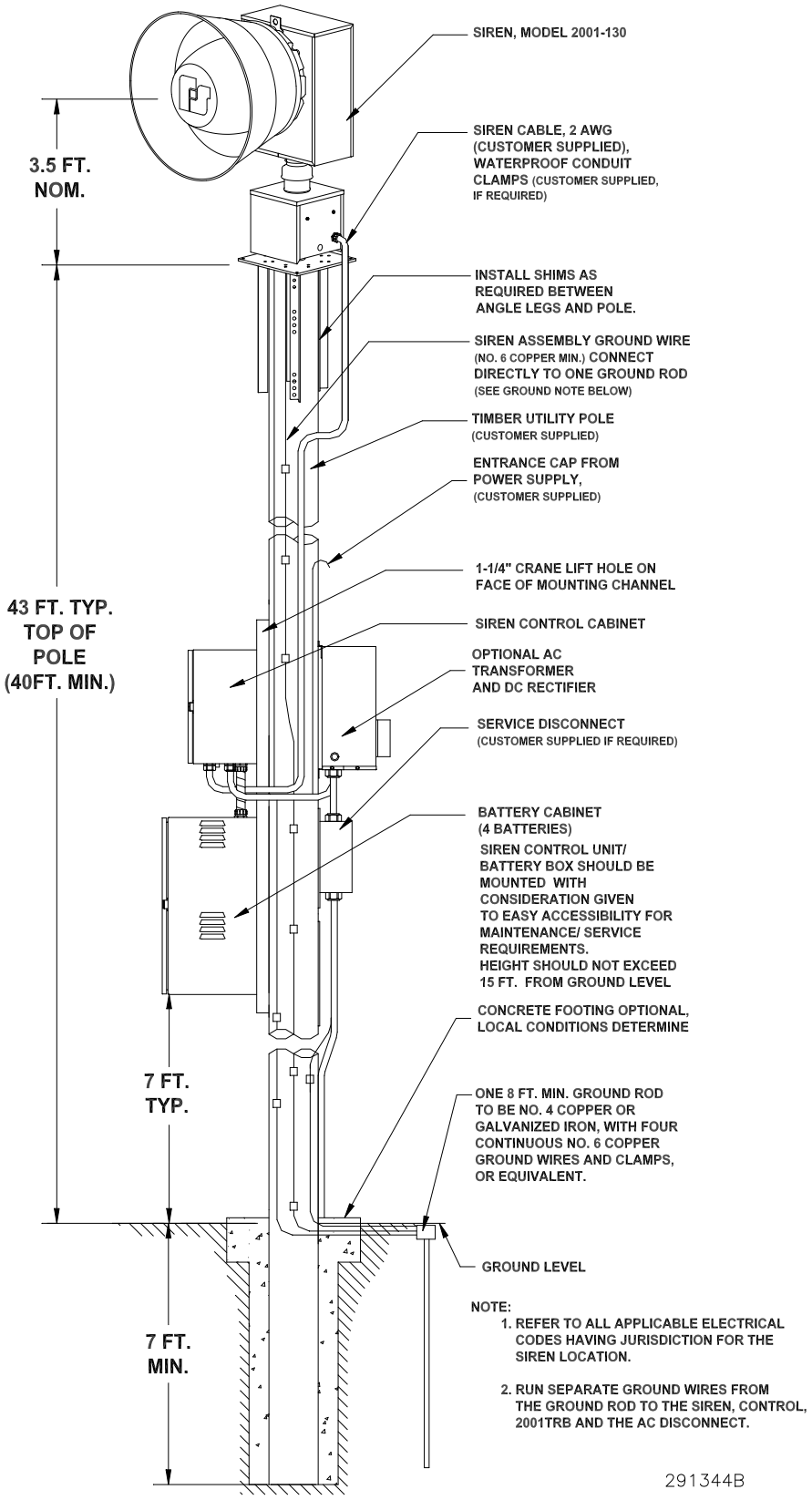
When mounting the Control/Battery System, it is recommended that the units be out of reach to avoid vandalism but accessible to service personnel. Both cabinets come equipped with padlock hasps. Use these for added security.

The control and battery cabinets are shipped mounted on an aluminum channel with four mounting holes for 1/2-inch bolts. The total weight of the Control/Battery System is approximately 364 pounds including the batteries. Therefore, insure that the mounting surface and fasteners can safely sustain the weight of the assembly and any additional environmental stresses placed on it.

Refer to Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing on page 46.

NOTE: When installing this product, insure that Local and NEC guidelines are followed.

Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing



Control/Battery System Installation

The Control Cabinet and Battery Cabinet is attached to a length of 5 inches channel. There are five pre-drilled holes in the channel:

- One 1-1/4 inches convenient lifting point
- Four 5/8 inch mounting holes

The total weight of the Control/Battery System including batteries is approximately 364 lb (165 kg). Therefore, it is imperative that the mounting surface and mounting method selected can safely sustain the weight of the assembly. In addition, the mounting method and surface used must be able to withstand external mechanical stresses that may be applied to the assembly.

Installer Supplied Material List

The following is a general list of material required to install the model DCB/DCFCB/DCFCTB with a mechanical siren (2001-130, Equinox, 508-128, and Eclipse8), and the 2001TRBP option. This list varies depending on mounting methods, length of pole, other options, local electrical codes, etc. Therefore, use this list as a reference guideline only. Stainless steel hardware is recommended.

Table 33 Installer Supplied Material List

Material Description		QTY
1. 240 Vac, 1 phase/3 wire, fused disconnect		1 each
2. FRN 30, 30 A time delay fuse		2 each
3. 100 A meter socket	(if required)	1 each
4. 1 inch meter hub	(overhead service only)	1 each
5. 1 inch service entrance	(overhead service only)	1 each
6. Fork bolt	(overhead service only)	1 each
7. ½ inch Liquid-Tight, 90 degree connectors	(2001TRBP option primary feed)	2 each
8. 1 inch Liquid-Tight 90 degree connector	(2001TRBP option secondary feed)	1 each
9. 1 inch Liquid-Tight 45 degree connector	(2001TRBP option secondary feed)	1 each
10. ½ inch EMT compression box connector	(disconnect/meter ground)	1 each
11. 1 inch heavy wall compression fittings	(rotator cabinet/OH meter)	1 each
12. ½ inch Liquid-Tight flexible conduit	(2001TRBP option primary feed)	18 inches
13. 1 inch Liquid-Tight flexible conduit	(2001TRBP option secondary feed)	7½ inches
14. ½ inch EMT thin wall conduit	(disconnect/meter ground)	10 feet
15. 1 inch aluminum rigid	(if applicable in your area/cabinetry-siren raceway)	50 feet
16. ½ inch nail drive straps	(securing ½ inch ground pipe)	4 each
17. ½ inch jiffy straps	(substitute for nail straps)	4 each
18. 1 inch heavy wall 2-hole straps	(1 inch raceway clamping)	15 each
19. 1 inch lock rings	(1 inch raceway tightening)	5 each
20. 1 inch plastic bushings		2 each

Material Description		QTY
21. ½ inch plastic bushings		2 each
22. 1 inch close nipple	(1 inch raceway/cabinet-siren)	1 each
23. 1 inch chase nipple	(1 inch LB-cabinet connection)	1 each
24. 1 inch LB's with gaskets and covers	(1 inch raceway/cabinet-siren)	2 each
25. Split bolts, 10 AWG wire	(2001TRBP option primary connection)	2 each
26. Mechanical lugs, 2 AWG wire	(2001TRBP option/siren motor feed)	6 each
27. Mechanical lugs, 6 AWG wire	(system ground)	4 each
28. #6 copper ground wire	(system ground)	75 feet
29. 5/8 inch x 8 inch Copper Ground rod	(system ground)	1 each
30. Ground rod connector cold water type/ acorn style	(system ground)	1 each
31. 1 ¼ inches to 1 inch Reducing washer	(meter socket/O.H. service)	2 each
32. 1 ¼ inches Galvanized staples	(securing ground wire to pole)	30 each
33. ¾ inch Galvanized staples	(securing antenna cable)	30 each
34. 12 AWG THHN stranded CU wire	(orange/rotator motor feed)	40 feet
35. 14 AWG THHN stranded CU wire	(black/charger circuit)	40 inches
36. 14 AWG THHN stranded CU wire	(white/charger circuit)	40 inches
37. 10 AWG THHN stranded CU wire	(black/TR option primary)	30 inches
38. 16 AWG THHN stranded CU wire	(optional, black/proximity sensor)	45 feet
39. 16 AWG THHN stranded CU wire	(optional, brown/proximity sensor)	45 feet
40. 16 AWG THHN stranded CU wire	(optional, blue/proximity sensor)	45 feet
41. 2 AWG, 600V, stranded CU wire	(optional, 2001TRBP 48 V and ground)	12 feet
42. Green electrical tape (33+)	(ground wire identification)	1 roll
43. Red electrical tape (33+)	(48+ wire identification)	1 roll
44. White electrical tape (33+)	(neutral wire identification)	1 roll
45. Black electrical tape (33+)	(connector insulating wrap)	1 roll
46. Blue electrical tape (33+)	(identification marking)	1 roll
47. Rubber tape	(insulating connections)	1 roll
48. Spade crimp connector	(red-14 ga. wire/charger circuit)	2 each
49. Ring crimp connector	(1/4 inch stud size 12 ga. wire/rotator feed)	1 each
50. 1/4 x 20 ¾ inch hex head bolt	(ground connection on siren leg)	1 each
51. 1/4 x 20 standard flat washer	(ground connection on siren leg)	1 each
52. 1/4 x 20 inches intern/ extern star washer	(ground connection on siren leg)	1 each
53. 1/4 x 20 split washer	(ground connection on siren leg)	1 each
54. 1/4 x 20 hex head nut	(ground connection on siren leg)	1 each
55. 5/16 hex head nut	(ground connection on control cabinet)	1 each

Material Description		QTY
56. ½ inch x 4 inches hex head lag bolt	(securing TR option to utility pole)	3 each
57. ½ inch x 6 inches hex head SS lag bolt	(securing siren/control cabinet to utility pole)	16 each
58. ½ inch SS (stainless steel) flat washers	(backing ½ inch lag bolts)	19 each
59. 10 x 1 inch hex head, slotted, sheet metal screws (securing straps/equip to pole)		1 box
60. 10 x 2 inches hex head, slotted, sheet metal screws (securing straps/equip to pole)		1 box
61. 10 x 3 inches hex head, slotted, sheet metal screws (securing straps/equip to pole)		1 box

Pole Mounting

To install the Control/Battery System to a pole, do the following:

1. Remove any batteries from the Battery Cabinet before lifting the Control/Battery System.
2. Use a crane to lift the Control/Battery System to the desired mounting height along the pole.
3. Use the crane to hold the Control/Battery System against the pole so that the four mounting holes on the mounting channel can be used as a template to drill four 3/8 inch holes at least 3-1/2 inch deep.
4. Attach the Control/Battery System to the pole using four user supplied ½ inch x 5 inches lag bolts. Slide a user supplied ½ inch flat washer onto each bolt before threading the bolt into the pole. Ensure the channel is plumb and straight. Do not bend the mounting channel by over tightening the lag bolts. Notch the pole or use shims if necessary to provide a flat stable mounting surface.
5. Mount a user supplied fused disconnect switch on the pole beneath or opposite the Control/Battery System assembly in accordance with Local and National Electrical Codes.
6. If the optional Transformer/Rectifier is required, drill three 3/8 inch holes at least 3-1/2 inches deep using the Transformer/Rectifier as a template. Attach the cabinet to the pole using three user-supplied ½ inch x 5 inches lag bolts. Slide a user-supplied ½ inch flat washer onto each bolt before threading into pole.

Flat Surface Mounting

To install the Control/Battery System to a flat surface, do the following:

1. Remove any batteries from the Battery Cabinet before up righting the Control/Battery System.
2. Prepare the mounting surface for hanging the assembly using the steel channel as a template.
3. Attach the Control/Battery System to a wall or other substantial vertical surface using the four 5/8 inch mounting holes.
4. Mount a user supplied fused disconnect switch in accordance with Local and National Electrical Codes.
5. If the optional Transformer/Rectifier is required, attach the cabinet to a wall or other substantial vertical surface using the three mounting holes. Make sure that the mounting surface and mounting method selected can safely sustain the weight of the transformer. The weight of the Transformer/Rectifier is approximately 150 lb.

Electrical Connections

⚠ WARNING

Install the siren electrical system in compliance with local electrical codes and NEC recommendations. Federal Signal also recommends that all user-installed conduit connections enter from the bottom of the cabinet. Disconnect all power and read all warnings at the beginning of this manual and on the batteries before making connections.

⚠ CAUTION

The siren and control system must be solidly connected to an earth ground. If the siren is installed in a building, ground the system to a metallic object known to be grounded. For pole mount installations, drive a metal rod or bar at least 8 feet into the ground, as close as practical to the base of the pole. Use a separate, continuous 6 AWG or larger wire from the siren frame to ground and from the cabinet of each siren control system to ground.

Siren Connections

The complete system wiring diagrams are shown in Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83. All interconnections between the Siren and Control System are accomplished using three wires. Two 2 AWG wires provide operating power to the siren motor. A single 12 AWG wire provides operating power to the rotator motor.

There are two terminal blocks located in the rotator housing of the siren that accept stripped wire, and a terminal block and relays in the control box that accept 1/4 inch and 5/16 inch ring terminals. These points provide convenient locations for making connections. Refer to the Options section on page 67 for wiring of options.

Siren and Control Cabinet Interconnecting Wiring

To connect between the siren and the Control Cabinet, do the following:

1. Install a 1 inch user-supplied electrical conduit fitting in the bottom of the Control Cabinet and in the bottom of the siren rotator housing.
2. Install 1 inch user-supplied electrical conduit between the conduit fitting in the bottom of the siren rotator housing and the conduit fitting at the bottom of the Control Cabinet.
3. Route the interconnecting wiring (user-supplied) from the siren rotator housing to the Control Cabinet through the conduit.
4. Connect a red 12 AWG wire from terminal 1 of the three position terminal block (TB1) in the rotator housing to the bottom open terminal of the rotator control relay, K1, using a ¼ inch ring terminal (user-supplied) at K1.
5. Connect a red 2 AWG wire from terminal 2 of the three position terminal block (TB1) in the rotator housing to the open left side of the 200 A fuse (148A147A) using a ¼ inch ring terminal (user-supplied). Refer to Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83.
6. Connect a black 2 AWG wire to terminal 3 of the three position terminal block (TB1) in the rotator housing. Run the black 2 AWG wire to a 5/16 inch backplane ground stud in the control cabinet (labeled GND) using a 5/16 inch ring terminal (user-supplied).
7. Ground the Siren and Control System to earth ground using separate continuous runs of wire (do not “T” from another ground wire).
8. Tighten all connections securely to provide good electrical connections.

AC Power Connections

To connect the wires in the Control Cabinet, do the following:

1. As shipped from the factory, the Control Cabinet is configured for 120 Vac operation. The ac selector switch, S7 on the siren control board and charger, must be set to the appropriate voltage.
2. After drilling or punching an appropriate sized hole in the bottom of the Control Cabinet, install a user supplied ½ inch electrical conduit fitting. Route ½ inch conduit (steel preferred) between a user-supplied fused disconnect switch and user-supplied conduit fitting in the bottom of the Control Cabinet.

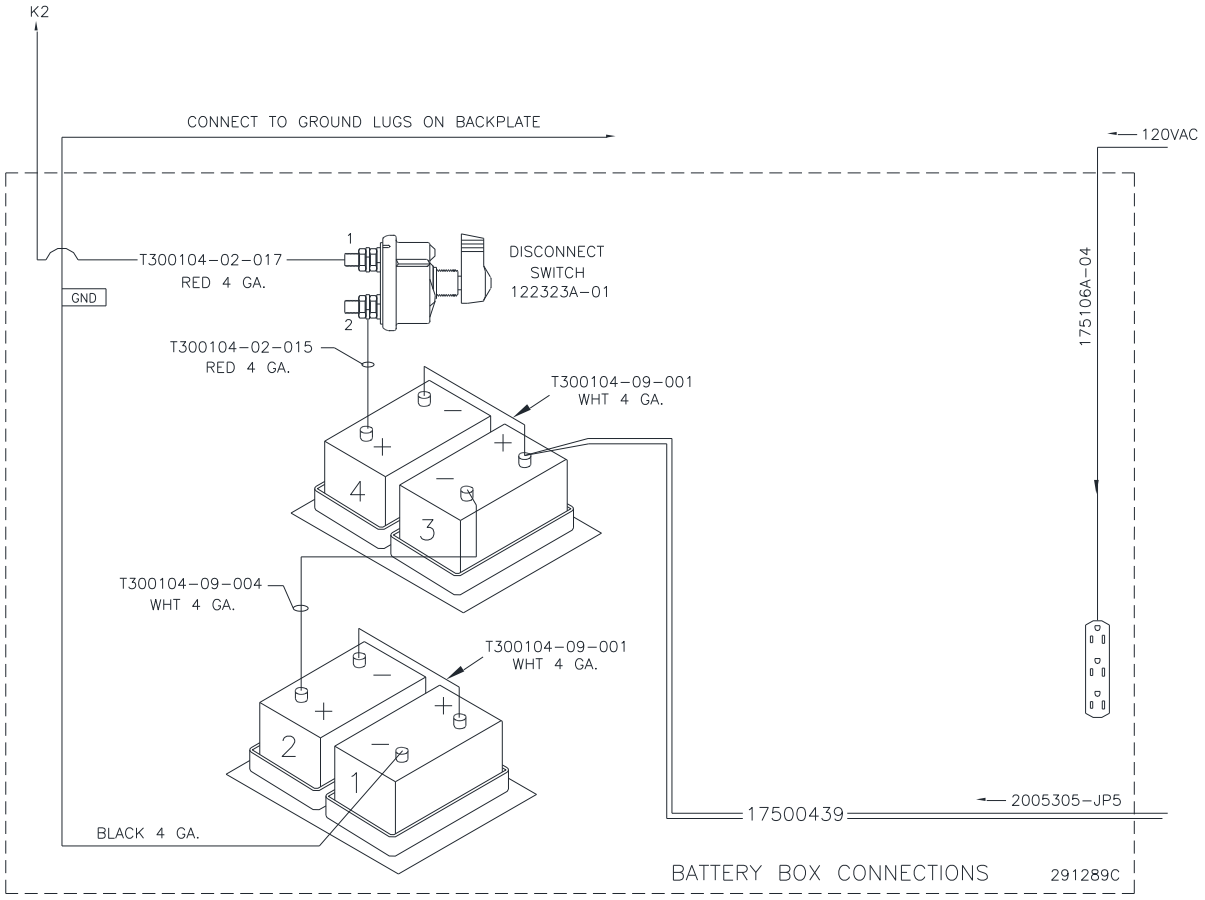
3. Route three user-supplied wires through the conduit that was just installed between the Control Cabinet and the fused disconnect switch. Use 14 AWG wire or larger.
4. Connect Neutral (white wire) from service disconnect to F1 on the DIN rail in Control Cabinet (refer to Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83.)
5. Connect Line (black wire) from service disconnect to F2 on the DIN rail in Control Cabinet (Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83.)
6. Connect Ground (green wire) from service disconnect to the green ground block on the DIN rail in Control Cabinet (refer to Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83). A small screwdriver must be pushed into the square opening in the terminal block to open the contacts of this block.
7. Follow the instructions included with the lightning protector (supplied) and install it in the service disconnect.
8. Size fuse or circuit breaker in service disconnect to 15 A max.

Battery Installation and Wiring

To install the batteries and connect the wiring, do the following:

1. Install the batteries in the Battery Cabinet, per illustration Figure 5 Battery Positioning and Wiring, taking care not to touch the battery terminals against cabinet. It may be necessary to temporarily relocate the wiring in the enclosure before installing the batteries. The polarity of the battery terminals is clearly marked on the battery case. See Figure 5 Battery Positioning and Wiring for correct orientation. (For optional battery warmers, refer to the Model HTR4 (Battery Warmers) section on page 72 and Figure 12 HTR4 Wiring Diagram).
2. There are several wires entering the Battery Cabinet: a red 4 AWG, a black 4 AWG, and a multiple conductor cable. The red and black 4 AWG wires provide 48 Vdc operating power to the siren. The multiple conductor cable provides the charge current for the batteries. Several white wires with lugs on each end are also packaged with the batteries. These white wires are used to connect the batteries in series.
3. Connect the wires to the batteries per Figure 5 Battery Positioning and Wiring and securely fasten all connections.
4. Apply user supplied silicon grease, or other oxide inhibiting compound to the battery terminals.

Figure 5 Battery Positioning and Wiring



Landline Control

You may activate the controller by applying contact closures to the remote activation inputs. Refer to the Landline and Local Pushbutton Activation section on page 32 for a functional description and details on interfacing and wiring connections.

Antenna Installation

⚠ WARNING

To prevent electrocution or severe personal injury, install antenna away from power lines and install with proper grounding. Refer to section 810 of the National Electrical Code, ANSI/NAPA No. 70. Refer to Figure 8 Antenna Grounding on page 60 for details.

A factory installed internally wired Type N bulkhead is provided on the bottom side of the Control Cabinet for ease of antenna cable interface. The bulkhead requires the installation of a male Type N connector on the antenna cable for correct interface. It is essential that the installer follow all tuning (if applicable), installation and safety instructions provided by the antenna manufacturer.

Yagi Antenna Installation

Yagi Antenna Pre-Assembly Instruction

To pre-assembly the antenna, do the following:

1. Unpack the antenna and locate the following parts:
   - Boom (1-14 inches for 5 element model, 7/8 inch dia. for 3 element model)
   - 3/8 diameter elements (y---3 = 3 elements, y----5 = 5 elements)
   - Gamma match parts bag
   - Mounting bracket parts bag
2. Find the proper element dimension chart for your antenna, within the antenna instructions, and trim each element according to your operating frequency. Use care to trim equal lengths from each end of each element ensuring that the mounting hole is at the center.

   NOTE A: Proper trimming and adjustment is critical to the Voltage Standing Wave Ratio, known as VSWR. (High reflected power levels decrease forward power. The life of the radio and transmit capabilities are dependent upon the VSWR being low as possible).

   NOTE B: If two frequencies are being used, then trim the antenna to the transmit frequency of the system where the antenna is mounted.
3. Insert the elements into their respective locations through the boom, starting with R1 (the reflective element) in the hole closest to the mounting holes. Then insert Dr, D1 etc. in that order.

   NOTE A: Shortest element is furthest away from the mount and increases in size as it gets closer to the mount.

NOTE B: Be very careful to line up the holes and not cross thread when securing the elements in the next step. The bolts must tighten all the way down upon the lock washers.

4. Secure the elements with the stainless steel 10-32 hex bolts and #10 lockwashers provided.
5. Locate the connector/brass tube assembly in the gamma match parts bag and insert the assembly first through the connector bracket, then thread the connector into the bracket. Be sure to tighten the connector fully. A drop of Locktite or other thread lock may be used in the threads to eliminate the possibility of the connector loosening.
6. Slide the gamma link onto the driven element and assemble the gamma match as shown in figure 1 or 2 (under the antenna instructions provided by the antenna manufacturer). Set dimensions "A" and "B" to those shown in table 1. Setting the match to the dimensions shown for your antenna is a good starting point, which allows you to quickly line tune later. Complete the assembly by attaching the end cap onto the end of the gamma tube. The antenna is now ready for final tuning.

Final VSWR Tuning

To final tune the antenna, do the following:

1. Before final installation of the antenna, temporarily set it up in a clear area at least six feet above the ground.

   NOTE A: Do not touch the antenna while the radio is transmitting.

   NOTE B: Ensure antenna is not touching any conductive material and is pointed away from all objects and people. Pointing antenna at objects in close proximity may act as a reflector and create inaccurate readings.

2. Apply RF power to the antenna at the transmit frequency to be used at that antenna, and check for the low VSWR while performing each of the following steps.

   A. Loosen the setscrew with the Allen key provided and make a slight adjustment to the aluminum gamma tube for the lowest VSWR (Reflected power).

   B. Adjust the gamma link along the driven element for the lowest VSWR.

   C. Repeat the above steps until the lowest VSWR is achieved. Reflected power must be less than 10% of the forward power.

D. Return to the dimensions shown in the antenna instructions, if there is any trouble achieving a good match. If the element dimensions are incorrect for the frequency being used, low VSWR may be unattainable. If the VSWR specification is still unattainable, replace the cable (A simple ohm meter check of the cable does not guarantee that the antenna cable is good, due to the DMM not having the ability to check the cable at high frequencies.) If that does not take care of the problem, replace the antenna.

Mount Yagi Antenna

Refer to Figure 6 Yagi Antenna Installation Example on page 58.

To install the Yagi antenna, do the following:

1. Install antenna, (using installation bracket or equivalent) as high as possible, such that the antenna cable and obstacles allows, and install on side of pole closest to the receiving station. Aim antenna at receiving station.

   Install a service loop when routing antenna cable.

   NOTE: Objects around the antenna affects the antenna, keep antenna pointed away from objects.

2. Ensure antenna cable connections are tight. Seal all connection points with heat shrink or tape and seal with Scotch Coat, or equivalent.

3. Apply RF power to the antenna at the transmit frequency to be used at that antenna, and check the VSWR (Reflected power). Reflected power must be less than 10% of the forward power.

   If the VSWR specification is unattainable, replace the cable (a simple ohm meter check of the cable does not guarantee that the antenna cable is good, due to the DMM not having the ability to check the cable at high frequencies). If that does not take care of the problem, replace the antenna.

Omni Fiberglass Antenna Models: (no tuning required)

Refer to Figure 7 Omni Antenna Installation Example.

To install the Omni antenna, do the following:

1. Install antenna, (using installation bracket or equivalent) as high as possible, such that the antenna cable and obstacles allows, and install on side of pole closest to the receiving station.

   Install a service loop when routing antenna cable.

   NOTE: Objects around the antenna affects the antenna, keep antenna away from objects, and at least ¼ wavelength from siren pole.
   ($\lambda = C/f$, where $C = 1.18 \times 10^{10}$ in/sec)

2. Ensure antenna cable connections are tight. Seal all connection points with heat shrink or tape and seal with Scotch Coat, or equivalent.

3. Apply RF power to the antenna at the transmit frequency to be used at that antenna, and check the VSWR (Reflected power). Reflected power must be less than 10% of the forward power.

   If the VSWR specification is unattainable, replace the cable (A simple ohm meter check of the cable does not guarantee that the antenna cable is good, due to the DMM not having the ability to check the cable at high frequencies). If that does not take care of the problem, replace the antenna.

Figure 6 Yagi Antenna Installation Example

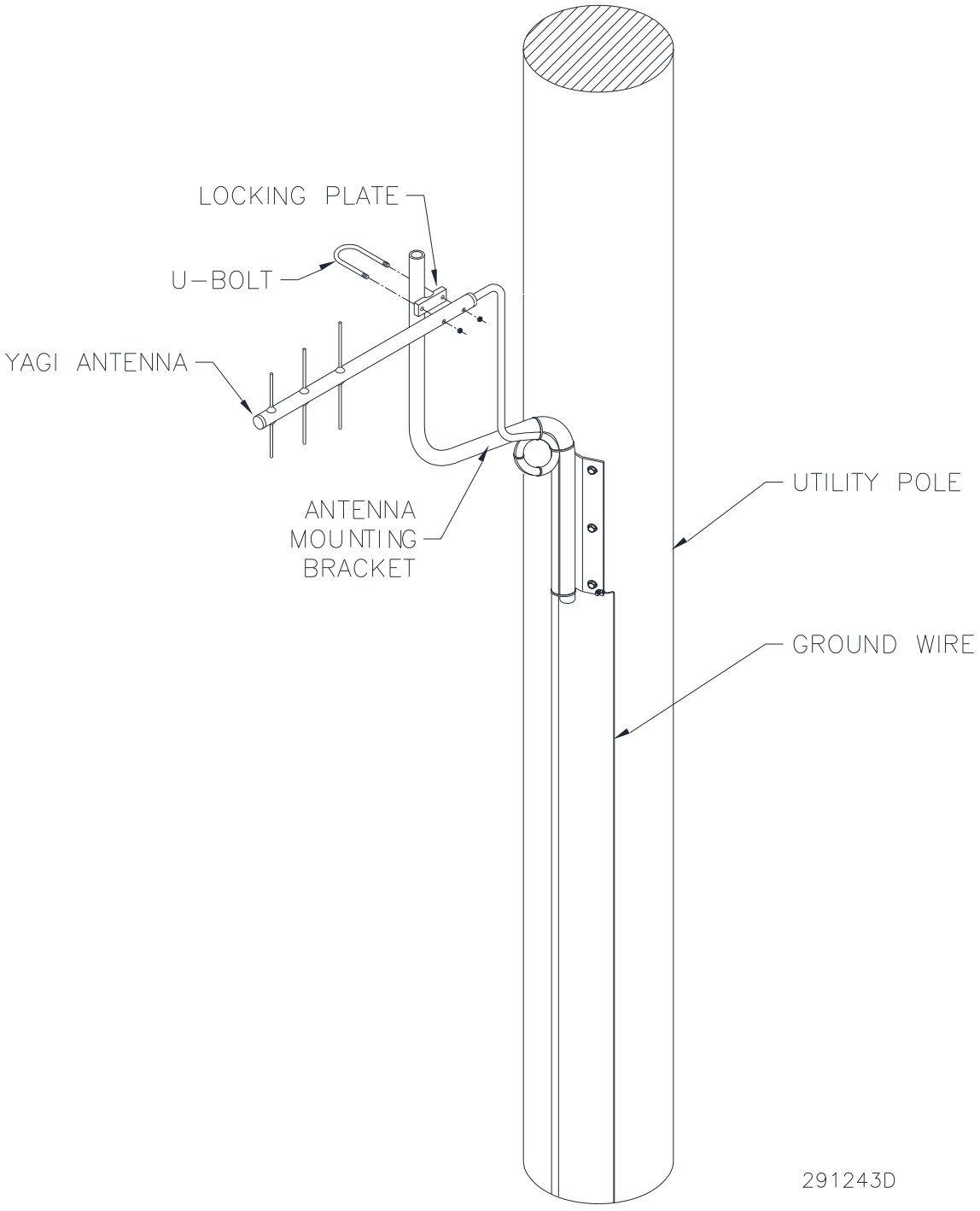


Figure 7 Omni Antenna Installation Example

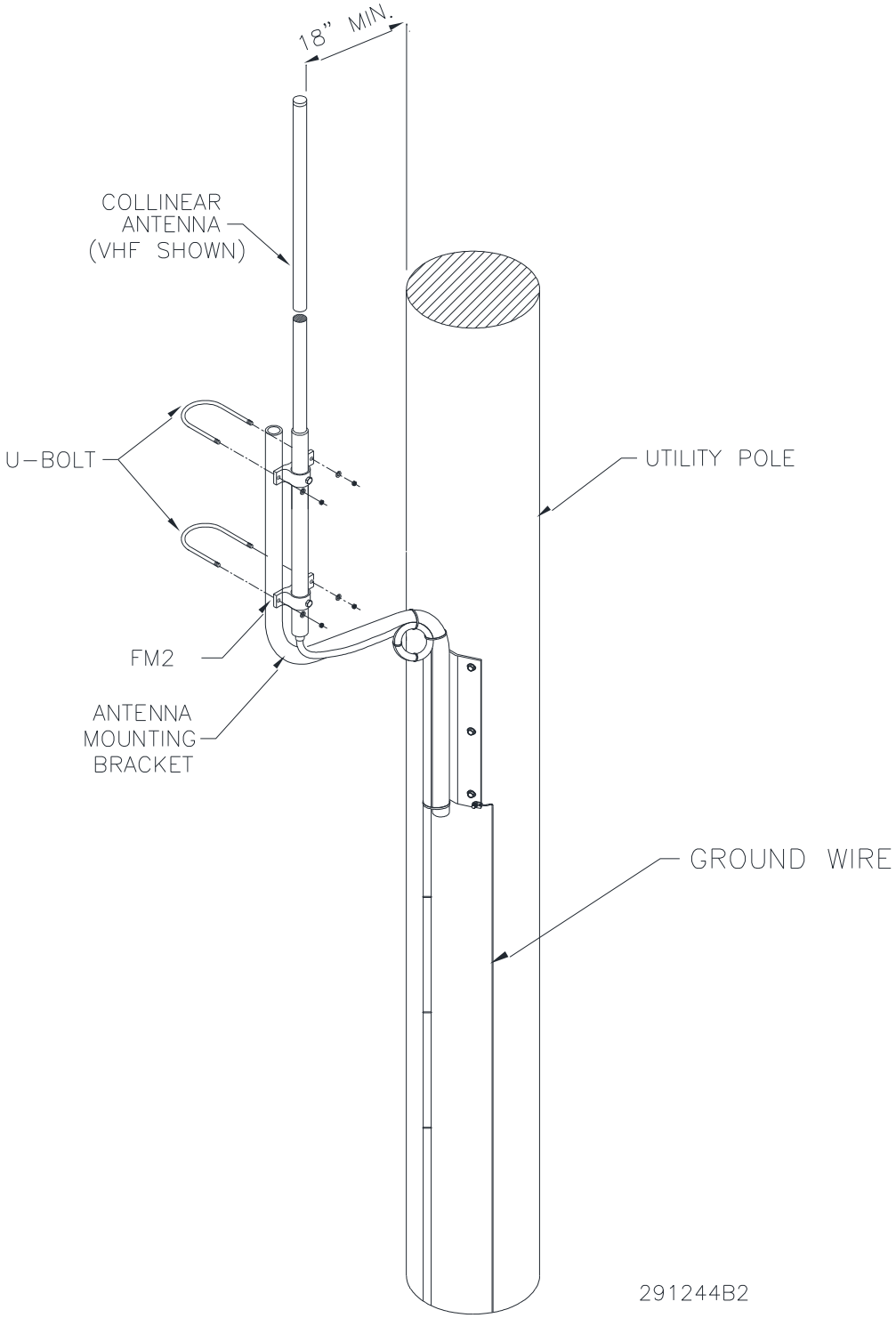
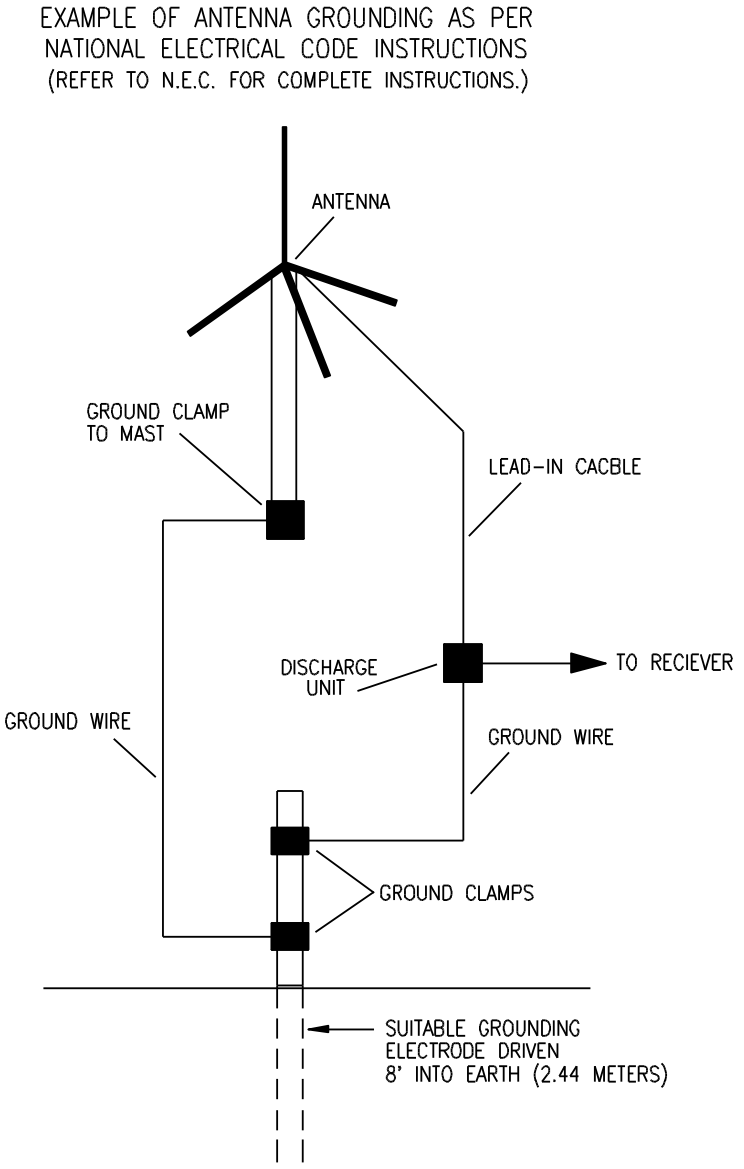


Figure 8 Antenna Grounding



A. USE NO. 10 AWG COPPER, NO. 8 AWG ALUMINUM, NO. 17 AWG COPPER CLAD STEEL OR BRONZE WIRE, OR LARGER AS GROUND WIRE FOR BOTH MAST AND LEAD-IN.

B. SECURE LEAD-IN CABLE FROM ANTENNA TO ANTENNA DISCHARGE UNIT AND MAST GROUND WIRES TO HOUSE WITH STAND-OFF INSULATORS, SPACED FROM 4 FEET (1.22 METERS) TO 6 FEET (1.83 METERS) APART.

C. MOUNT ANTENNA DISCHARGE UNITS AS CLOSE TO WHERE LEAD-IN CABLE ENTERS HOUSE AS POSSIBLE.

291160

Pre-operational System Testing

⚠ WARNING

The output sound level of a siren is capable of causing severe hearing discomfort or permanent hearing damage. Therefore, always wear adequate hearing protection and minimize exposure time when performing any testing or maintenance on the siren.

⚠ WARNING

Failure to properly test the siren system before placing into service may prevent the siren from operating in an emergency. The following tests and calibrations must be performed by an experienced technician prior to using the siren system.

Initial Sensor Adjustments and Testing

To ensure proper and reliable two-way status operation, the operation and alignment of the sensors must be confirmed when the siren and control are installed. All of the sensors are factory adjusted and the following alignment instructions may only pertain to tuning replacement sensors.

Rotation Current Sensor

Locate the rotation current board (2005221) on the backplane of the control cabinet with the blue current sensor (refer to Figure 16 DCFCTB Wiring Diagram on page 83). This board is preset at the factory and should not be adjusted.

To check the board for proper operation, do the following:

1. Verify that the output at JP2-2 is high (4 – 5Vdc).
2. Activate a siren function by momentarily depressing one of the function pushbuttons on the controller board.
3. Measure the dc voltage on TP2. The voltage should correspond to the dc current draw of the siren motor (0.8 ADC, +/- .3 A).
4. Verify the output JP2-2 is low (0-1 Vdc) for the duration of the siren function.

Chopper Current Sensor

Locate the chopper current board (2001062) on the backplane of the control cabinet (refer to Figure 16 DCFCTB Wiring Diagram on page 83).

Adjustment Procedure

To adjust the chopper current board, do the following while the system is in idle mode:

1. Using Pot 1, adjust the voltage at TP2 to 7 Vdc.
2. Using Pot 2, adjust the voltage at TP4 to 4.5 Vdc.

Activate a siren function by momentarily depressing one of the function pushbuttons on the controller board. Verify that input #4 indicator on the controller board turns on for the duration of the siren function.

AC Power Sensor

Verify that the ac power indicator on the controller board is on while ac power is active. Measure across F1 TB5-1 and TB5-5 for 120 Vac. Confirm that with the ac power source turned off (using service disconnect) the ac power indicator is off.

Intrusion Sensor

With one cabinet door open, verify that intrusion indicator is ON. Depress the intrusion switch located on the cabinet door. With the switch depressed, confirm that the intrusion indicator is OFF. Verify the switches on both cabinet doors operate correctly.

NOTE: A jumper preset at JP9 also causes all of the LED's to go dim when intrusion switch is pressed.

Battery Voltage Measurement

To measure the battery voltage, do the following:

1. Allow the batteries to charge for 24 hours to ensure they are fully charged.
2. Turn off ac power to the battery charger by disconnecting power at the service disconnect or opening F1 and F2 in the Control Cabinet.
3. Using a digital multimeter (Fluke model 75 or equivalent), measure the batteries individually inside the Battery Cabinet (refer to Figure 16 DCFCTB Wiring Diagram on page 83 for details). Each battery should measure approximately 13.5 Vdc.

   Voltage reflects battery float voltage and varies depending on state of charge.

4. While monitoring the voltage in at TB4-1, manually activate a steady siren function by depressing the appropriate function pushbutton on the controller board. If the measured voltage drops below 40 Vdc, it is an indication of weak batteries and causes the controller to terminate the siren function. If a low battery condition is indicated, follow up by load testing each battery with an automotive type battery load tester (180 A load recommended).
5. Turn ac power on by connecting F1 and F2 and turning on the service disconnect switch.

Battery Charger Voltage Measurement

To measure the charger output voltage, it must be connected to the batteries. Since the battery's state of charge affects the output voltage of the charger, the measured voltages varies. Use a digital multimeter to measure the charger at TB1-4 and the voltage should be between 53.6 Vdc and 54.4 Vdc when connected to fully charged batteries.

2001TRBP Transformer/Rectifier 48 Vdc testing (optional)

To test the 2001TRBP Transformer/Rectifier, do the following:

1. With the ac service turned on, measure for 46.0 Vdc, +/- 0.5 Vdc between K3-3 and chassis ground (refer to Figure 10 Transformer Rectifier Wiring to Control).
2. Confirm that K3 is energized.
3. Shut off the ac service disconnect and confirm that K3 de-energizes.

Manual Siren Activation

Manually depress each function button and confirm correct siren operation. Refer to the controller programming and test data sheet (shipped with controller) for siren function details.

Landline Siren Activation (optional)

Confirm that the user-supplied telephone control relay provides each appropriate remote function input with a momentary contact closure (1 second nominal) and observe proper siren activation.

Transceiver Audio Level Adjustments and VSWR Testing

Due to the test equipment requirements and RF control systems knowledge required to perform the following controller testing; only a qualified two-way radio service technician should conduct the following test steps.

To ensure reliable radio controlled siren operation, the following testing must be conducted upon initial controller installation. For the following steps, connect the

Communications Service Monitor to the RF bulkhead mounted on the bottom side of the control cabinet.

DTMF Transmit Level Adjustments (DTMF versions of DCFCTB only)

To adjust the DTMF transmit level, do the following:

1. To transmit and generate a DTMF test tone, apply a jumper across JP15 on the FCT controller board.
2. Confirm the deviation level is at 3.0 kHz (or 1.5 kHz for a 12.5 kHz spaced channel). This level has been pre-set at the factory, however if adjustment is required, set R71 on the controller board for the required deviation.
3. Using an in-line Watt meter, confirm that the forward radiated power output matches the specified power output listed on the final test data sheet supplied with unit within 20%. Also verify that the VSWR is less than 5%. Refer to the Installation section if the VSWR is excessive.

FSK Transmit Level Adjustments (Digital FSK versions of DCFCTDB only)

To adjust the FSK transmit level, do the following:

1. To Transmit and generate an FSK modem tone, apply a jumper across JP15 on the FCT controller board.
2. Confirm the deviation level is at *3.0 kHz. This level has been pre-set at the factory; however if adjustment is required, set R70 on the controller board for the required deviation. If CTCSS is used, set the CTCSS level to 0.75 kHz.
3. Using an in-line Watt meter confirm that the forward radiated power output matches the specified power output listed on the final test data sheet supplied with unit within 20%. Also verify that the VSWR is less than 5%. Refer to the Installation section if the VSWR is excessive.

   ***NOTE**: Deviation levels are cut in half on 12.5 kHz spaced channels.

Receive Level Adjustments

To adjust the receive level, do the following:

1. Inject a 100uV carrier signal modulated with a 1 kHz tone at *3.0 kHz deviation for DTMF systems. Use *3.0 kHz deviation for digital systems.
2. Connect an oscilloscope to TP8 on the controller board and confirm a clean, undistorted sinewave of 1 V_{p-p}. The level has been pre-set at the factory; however, if adjustment is required, set R48 on the controller board to 1 V_{p-p} for the external transceiver. The level of the on-board receiver module is fixed and does not need to be adjusted.

   ***NOTE**: Deviation levels are cut in half on 12.5 kHz spaced channels.

Two-tone and DTMF Controller Decode-ability Testing

To test two-tone and DTMF controller decode-ability, do the following:

1. Unplug JP21 to disable the siren.
2. With the transmit modulation level set to *3 kHz from the communication monitor inject a 0.5 uV carrier signal.

   ***NOTE**: Deviation levels are cut in half on 12.5 kHz spaced channels.
3. Encode the appropriate DTMF strings and or 2-tone tones required to activate the desired siren function. Confirm reliable decoding of at least 10 of 10 tries.
4. Plug JP21 back in.

Confirming Controller Auto-Reporting

By toggling one of the following sensor inputs, confirm that the controller sends a correct report to the SS2000+/R base controller. Note that with digital systems the DCFCTDB must be programmed to auto-report the following sense points to perform this test.

Intrusion

Depress intrusion switch for at least 5 seconds. Release the switch. Verify the door closed and door open reports we received at the SS2000+/R.

AC Line Voltage

By removing ac power at the service disconnect confirm that a report is generated within 5 minutes. Confirm that another report is generated when power is restored.

⚠ WARNING

The output sound level of a siren is capable of causing severe hearing discomfort or permanent hearing damage. Therefore, always wear adequate hearing protection and minimize exposure time when performing any testing or maintenance on the siren.

Test Activation Codes

Test all siren functions from the siren control point. This test must be performed to ensure all desired siren functions have been properly entered at the control station and at the siren site. Request a report from the control station during the siren function. Verify the report indicates the proper status conditions for the site being tested.

Service and Maintenance

⚠ WARNING

The siren has moving parts, high operating current, explosive gases, corrosive materials, and high output sound levels which could cause severe personal injury, electrocution, or death.

Qualified personnel familiar with the siren, associated controls, and power sources being used, should perform service or maintenance.

Before servicing or maintaining, ensure that remote activation cannot occur and disconnect power to the siren and the associated control equipment.

Obtaining Service

If you are experiencing any difficulties, contact Federal Signal Customer Care at: 800-548-7229 or 708-534-3400 extension 5822 or Technical Support at: 800-524-3021 or 708-534-3400 extension 7329 or through e-mail at: techsupport-ans@federalsignal.com. For instruction manuals and information on related products, visit: http://www.alertnotification.net/

Preventative Maintenance

To insure that the warning system is fully operational and to maintain the highest possible level of reliability, perform the following monthly testing and annual inspection. In order to maintain the integrity of the warning system, prompt investigation of any reported failures must be researched and corrected promptly.

Monthly Testing

The following is a typical monthly test outline:

1. Reset all sirens to clear latched sensor status inputs (DTMF systems only).
2. Activate one of the siren functions (3 minute activation recommended). If the 240 Vac transformer/rectifier option is used, test both ac and dc operation. Test sirens using battery power. Ensure transfer relay operation is successful.
3. Poll the system for siren status reports.
4. Examine each site report for any failed condition. If you detect a failure condition, notify designated service personnel.

Annual Inspection

Perform the pre-operational system test procedure on an annual basis. Refer to the Pre-operational System Testing section on page 61 for details.

Options

Model 2001TRBP

The 2001TRBP is a transformer/rectifier for primary system power with battery back-up and allows the siren to operate from a 208, 220, or 240 Vac power source when ac power is available. During normal operation, the 2001TRBP maintains a charge to the standby batteries. During an ac power failure, an automatic switch to battery operation occurs to maintain the siren's normal operation. Specify the ac line voltage when ordering.

The 2001TRBP has a 115 Vac secondary tap to provide power to the siren Control Cabinet.

2001TRBP Mounting Location

Keep wire lengths to a minimum. Mount the transformer assembly as close as possible to the Control/Battery System.

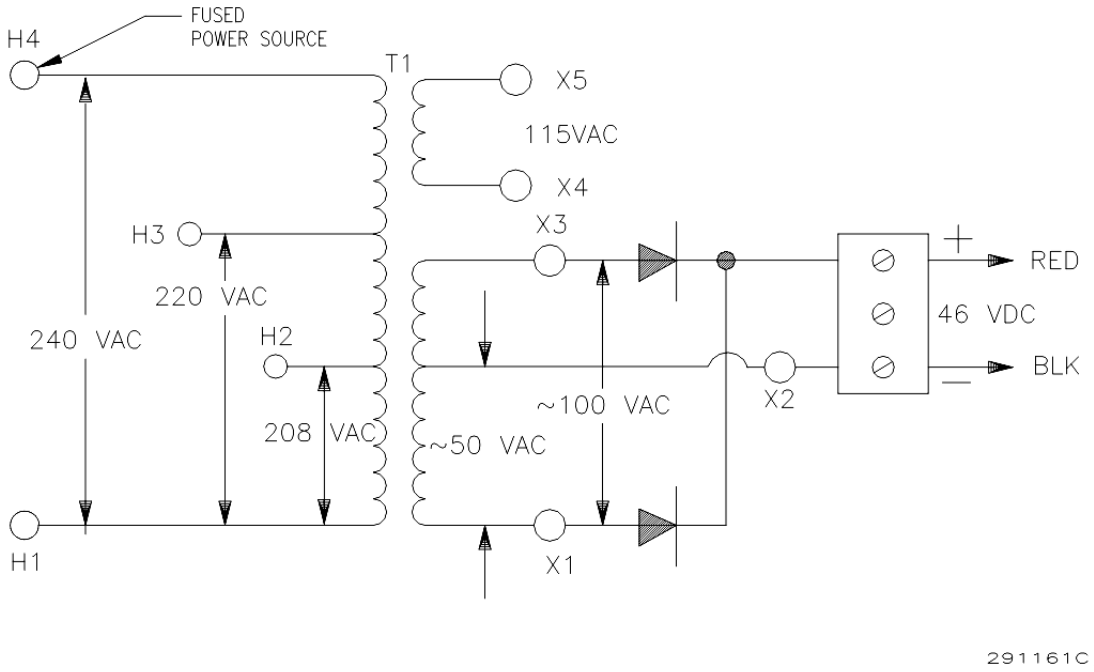
2001TRBP Wiring

⚠ DANGER

Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, only experienced electricians should install this product in accordance with local and National Electrical Codes.

NOTE: Federal Signal recommends using wire no smaller than 3 AWG between the transformer and the Control/Battery System. To perform the wiring, proceed as follows (refer to Figure 9 Schematic Diagram 2001TRBP and Figure 10 Transformer Rectifier Wiring to Control Cabinet).

Figure 9 Schematic Diagram 2001TRBP



⚠ WARNING

When wiring the Model 2001TRBP to the Control Cabinet, the installer must follow wiring instructions as in Figure 10 Transformer Rectifier Wiring to Control or damage may occur to Control System and/or batteries.

Preparation

To wire the 2001TRBP, do the following:

1. Refer to Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing on page 46, Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83.
2. Remove the 2001TRBP transformer from its shipping crate and stand the transformer on its top to expose the inspection covers located on the bottom side (refer to Figure 11 2001TRBP Transformer Rectifier Parts List).
3. Remove the four 3/8 inch hex head bolts that secure the inspection covers and remove the inspection covers from the transformer.
4. Pull the four primary lines marked H1, H2, H3, and H4 and secondary lines X4 and X5 from the inside of the transformer.
5. Punch or drill the plate, use one ½ inch conduit for ac in and one 1 inch conduit for 120 V and 48 V out to the controller.

6. Install a 1 inch 45 degree Liquid-Tight connector into the 1 inch opening on the transformer. Face the connector to the rear of the transformer and tighten the 1 inch lock ring. Put a 1 inch plastic bushing over the exposed thread end on the 1 inch connector.
7. Cut a section of 1 inch Seal-Tight, 7 inches in length. This provides raceway for the 48 Vdc secondary and for Control Cabinet 120 Vac input.
8. Cut a section of ½ inch Seal-Tight 18 inches in length. This provides A/C input voltage from the ac disconnect to the transformer. If the ac disconnect does not have 120 Vac available, the X4 and X5 taps in the 2001TRBP may be used to provide ac voltage to the Control Cabinet. In this case, run the Seal-Tight between the 2001TRBP and the siren controller.

Transformer Wiring

Transformer Primary	(2 each) 10 AWG, CU, stranded, black 40 inches in length.
Rectifier Output	(1 each) 2 AWG, CU, Black, 30 inches in length–48 Vdc Negative.
	(1 each) 2 AWG, CU, Red, 40 inches in length–48 V dc Positive.
Control Cabinet	(1 each) 14 AWG, CU, stranded, black 60 inches in length–120 Vac Line
	(1 each) 14 AWG, CU, stranded, white 60 inches in length–Neutral

To connect the transformer wiring, do the following:

1. The (2 each) 40 inches black 10 AWG lines provide 208/220/240 Vac for transformer primary input.
2. The 60 inches black, and the 60 inches white provide the ac input to the control cabinet. These wires will pass through the transformer as a raceway then be routed into the control cabinet unless the X4 and X5 taps are used in the 2001TRBP (refer to Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing on page 46, Figure 14 DCB Wiring Diagram, Figure 15 DCFCB Wiring Diagram, and Figure 16 DCFCTB Wiring Diagram on pages 81 to 83 for wiring details.)

   The 60 inch black and the 60 inch white provide the 120 Vac input to the DC Control Cabinet. It connects the terminal block in the 2001TRBP labeled X4 and X5 to TB5 F1 and F2.
3. The 30 inch black 2-AWG line provides the 48 Vdc negative to the DC Control Cabinet. It connects the terminal block in the 2001TRBP labeled "-" and the 5/16 inch ground stud on the backplane of the siren controller.
4. The 40 inch red 2 AWG line provides 48 Vdc positive voltage to the DC Control Cabinet. It connects to the terminal block in the 2001TRBP labeled "+" and to the labeled terminal (#3) at K3.

AC Line Wire Terminations

240 Vac operation	**Service disconnect**	**Transformer**
Transformer Primary: 2 each #10 black wires	L1	H1
	L2	H4

220 Vac operation	**Service disconnect**	**Transformer**
Transformer Primary: 2 each #10 black wires	L1	H1
	L2	H3

208 Vac operation	**Service disconnect**	**Transformer**
Transformer Primary: 2 each #10 black wires	L1	H1
	L2	H2

115 Vac Tap	**Service disconnect**	**Transformer**
Transformer Secondary		X4
		X5

NOTE A: Cap all unused taps with wire nuts

Figure 10 Transformer Rectifier Wiring to Control Cabinet

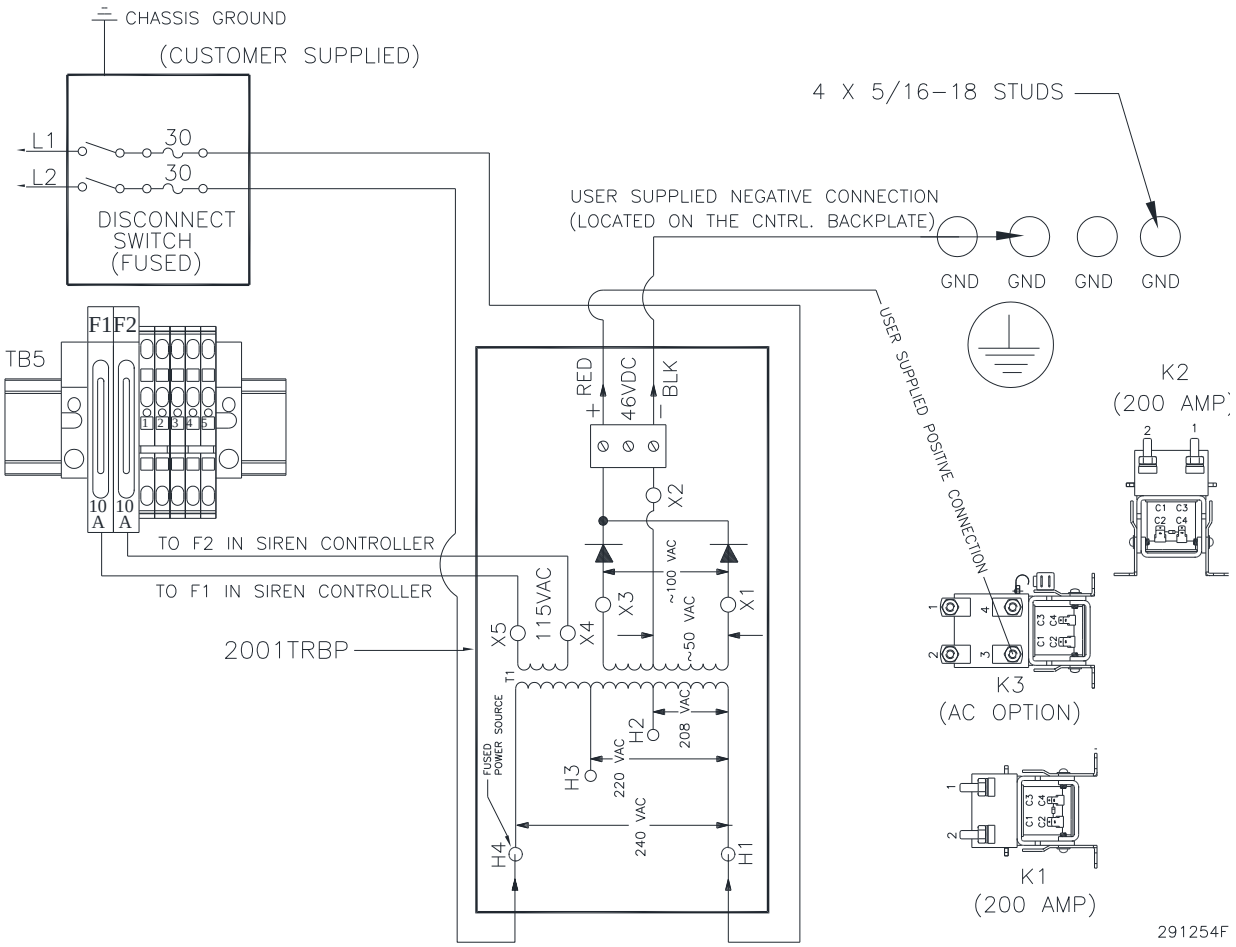
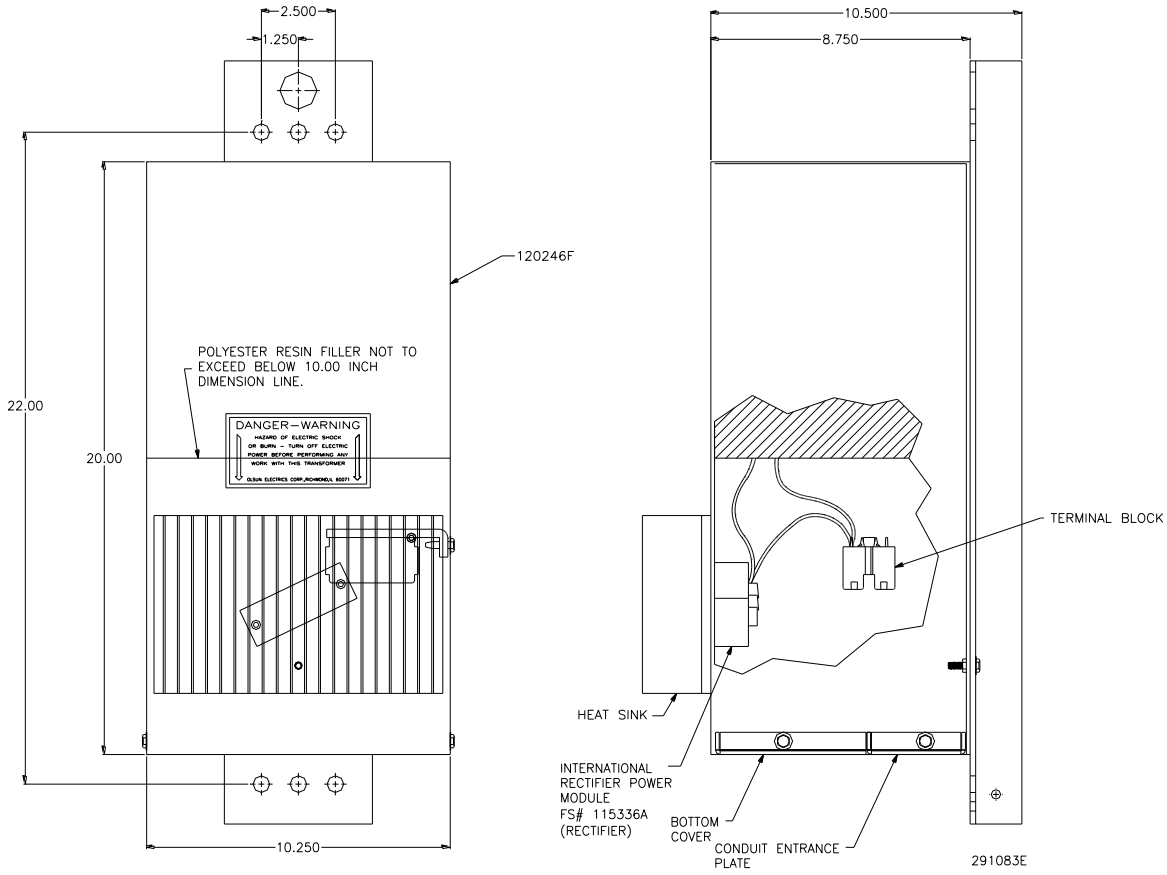


Figure 11 2001TRBP Transformer Rectifier Parts List



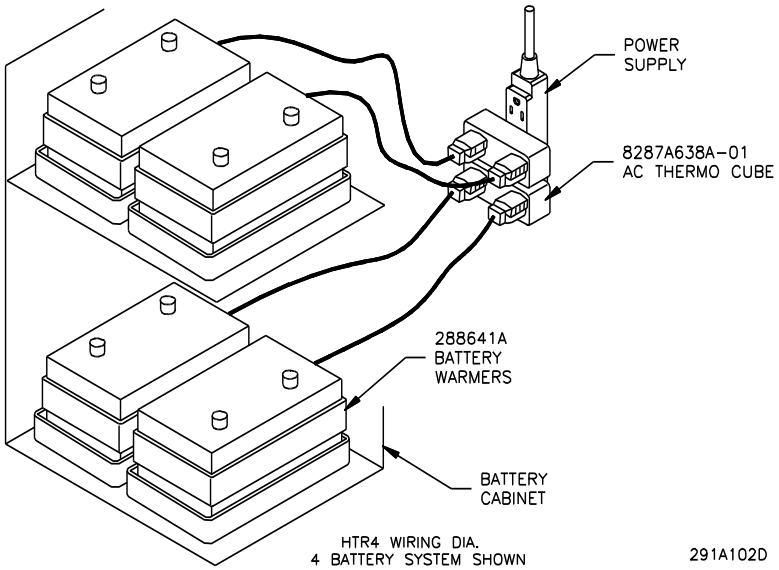
Model HTR4 (Battery Warmers)

⚠ CAUTION

If 240 Vac is used to power the FC board and charger directly, battery warmers are not allowed.

In locations where temperatures may drop below freezing for extended periods, the optional battery warmers are recommended to maintain battery efficiency. A thermostat provides on-off control of the warmers that senses the inside temperature of the Battery Cabinet. The battery warmer option is equipped with four battery warmers that are wrapped around each of the four batteries in the Battery Cabinet. The warmers are plugged into the cube taps, which plug into the thermostat cube, which is plugged into a 120 Vac outlet that is provided for in the Battery Cabinet. No other connection or mounting is required for this option.

Figure 12 HTR4 Wiring Diagram



⚠ DANGER

Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, only experienced electricians should install this product in accordance with national and local electrical codes.

Model 2001HR (Holding Relay)

This option enables the control of both of the siren motors from a single contact closure on one-way models. This feature is typically required for telephone line control systems and is only required if an FC is not purchased. The 2001HR is a holding relay, which holds the rotator motor on for 15 seconds after the control contact is released, keeping siren rotation active during wail signals. The control contact is wired between K2-C1 and ground.

Solar Power

When purchased, the solar option allows the siren to operate in areas where dc power is not available. The PVS220W-48 model for the DCFCB and DCFCTB controllers include a solar regulator and solar panel kit. When installed, the batteries are charged by the photovoltaic charging system, instead of a battery charger, to provide operational power to the siren. Refer to Figure 17 DCB and DCFCB Solar Wiring and Figure 18 DCFCTB Solar Wiring.

Model DCFCTBD-IP

General

The DCFCTBD-IP combines the characteristics of a DCFCTBD with serial to Ethernet conversion capabilities. This allows serial devices to communicate over an Ethernet network and provides audio decoding of digitized audio sent over the network.

The converter is configured with its own fixed IP address and port number. When packets of data are received over the Ethernet port that are addressed to the board's IP and port number, they are converted to serial data and sent out over the serial port. Likewise, any data coming into the serial port is converted to TCP/IP data packets and sent out over the Ethernet port to the server's IP address. The unit also contains a digital to analog converter. This allows specially configured incoming data packets to be converted to audio, which is then filtered and sent out over a 600 ohm audio port.

Ethernet Board Specifications

Electrical	
Input Voltage	10.5- 95 Vdc
Current Draw	<150 mA
Serial Port	
Serial Port Protocol	RS232C, N, 8, 1 baud rate configurable
Ethernet Port	
Protocol	IEEE 802.3, 10 Base-T connection
600 Ohm Audio Output Port	
Protection	MOV and Transorb surge protection
Impedance	600 ohms
Audio Output Level	Adjustable from 0.30 to 3.00 V_{p-p}, (-17 dB to +2.7 dB) into 600 ohms

Connectors

JP1	**600 Ohm Audio Output Port**
	Balanced line output.

JP3	**Audio Output Expanded or Flat Selection Jumper**
	Jumpers pins 1 and 2 for flat audio output.
	Jumpers pins 2 and 3 for expanded dynamic range audio output

JP4	**RS232 Serial Port**
JP5	**FLASH Programming and Converter Configuration Port**
JP6	**10.5-95 Vdc Power Input**
JP7	**Resets board back to factory default settings.**
J1	**Ethernet Network Port**

Indicators	
D1	CPU Heartbeat indicator, green
D2	Transmit data indicator, red
D3	Receive data indicator, yellow
D4	Power indicator, green

Controls	
R1	600 ohm audio output level set

Environmental	
Operating Temperature	-30°C - +65°C
Humidity	0-95% non-condensing

Physical	
Dimensions	~ 2 inches height, 4 inches width, 6.5 inches length.
Weight	< 2 lbs

Network Information

Protocols Supported

- TCP/IP
- UDP (optional)
- XML (optional)
- XMPP (optional)

IP Ports Used

- 16887 (SmartMsg TCP/IP)
- 80 (HTTP)
- 3100 (optional UDP Serial Over IP)
- 3101 (optional UDP Voice Over IP)

IP Address

User selectable

TOS/DSCP (Type of Service)

User selectable

Bandwidth Requirements

Voice Over IP	150K baud per connection
Siren Activation	50 bytes per connection
Siren Poll Response	74 bytes per connection

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Figure 13 FC Control Board

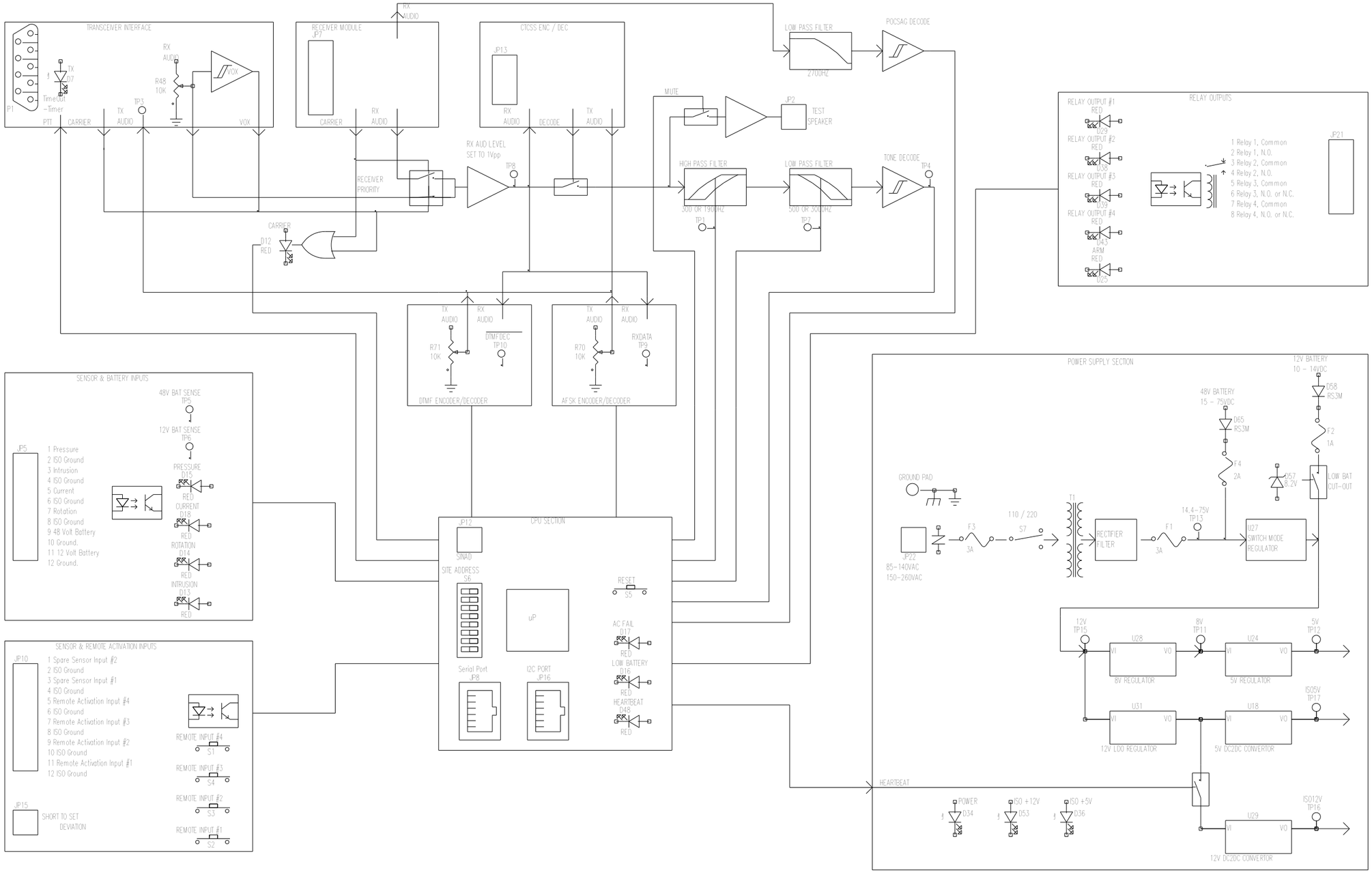


Figure 14 DCB Wiring Diagram

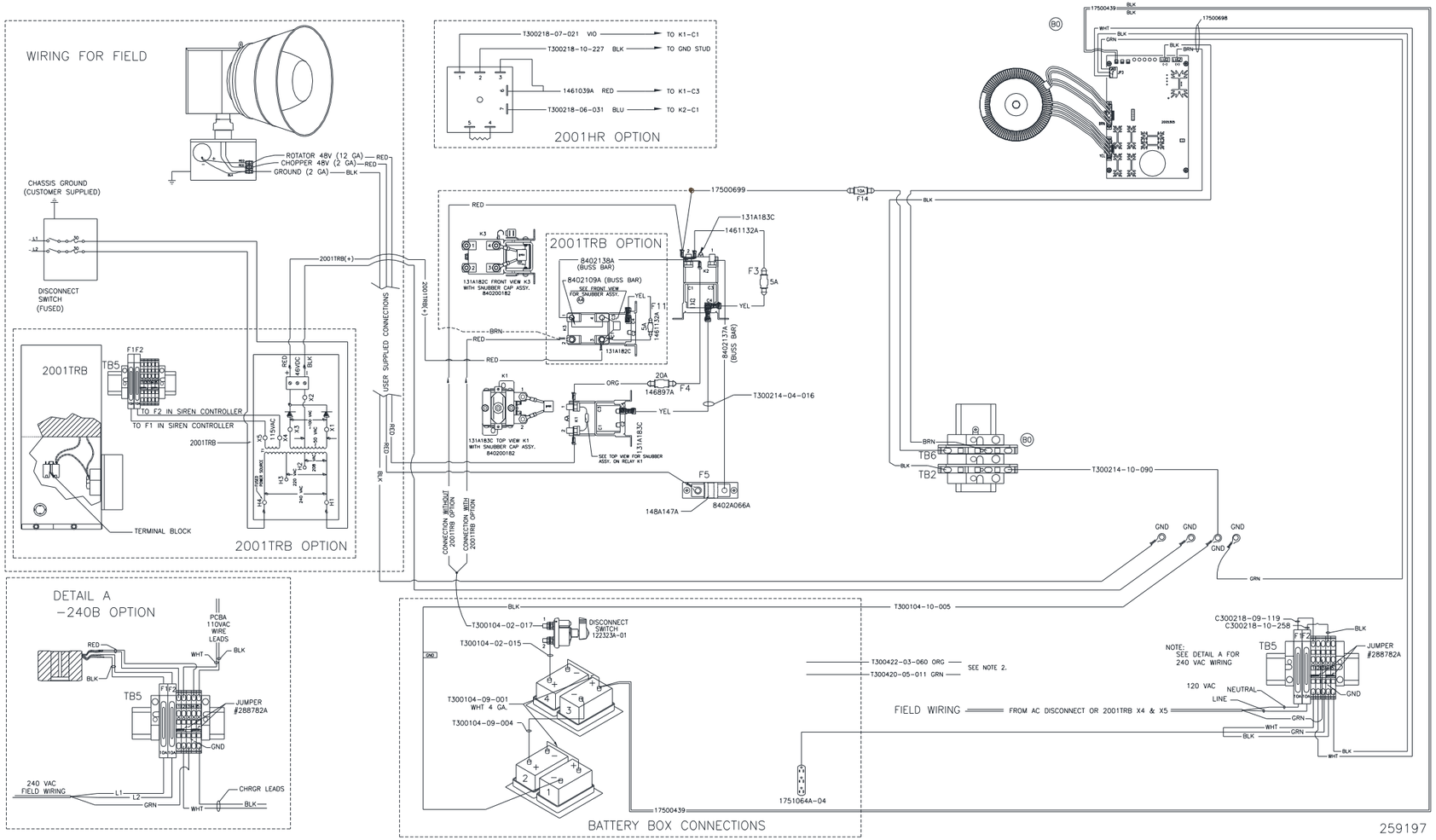


Figure 15 DCFCB Wiring Diagram

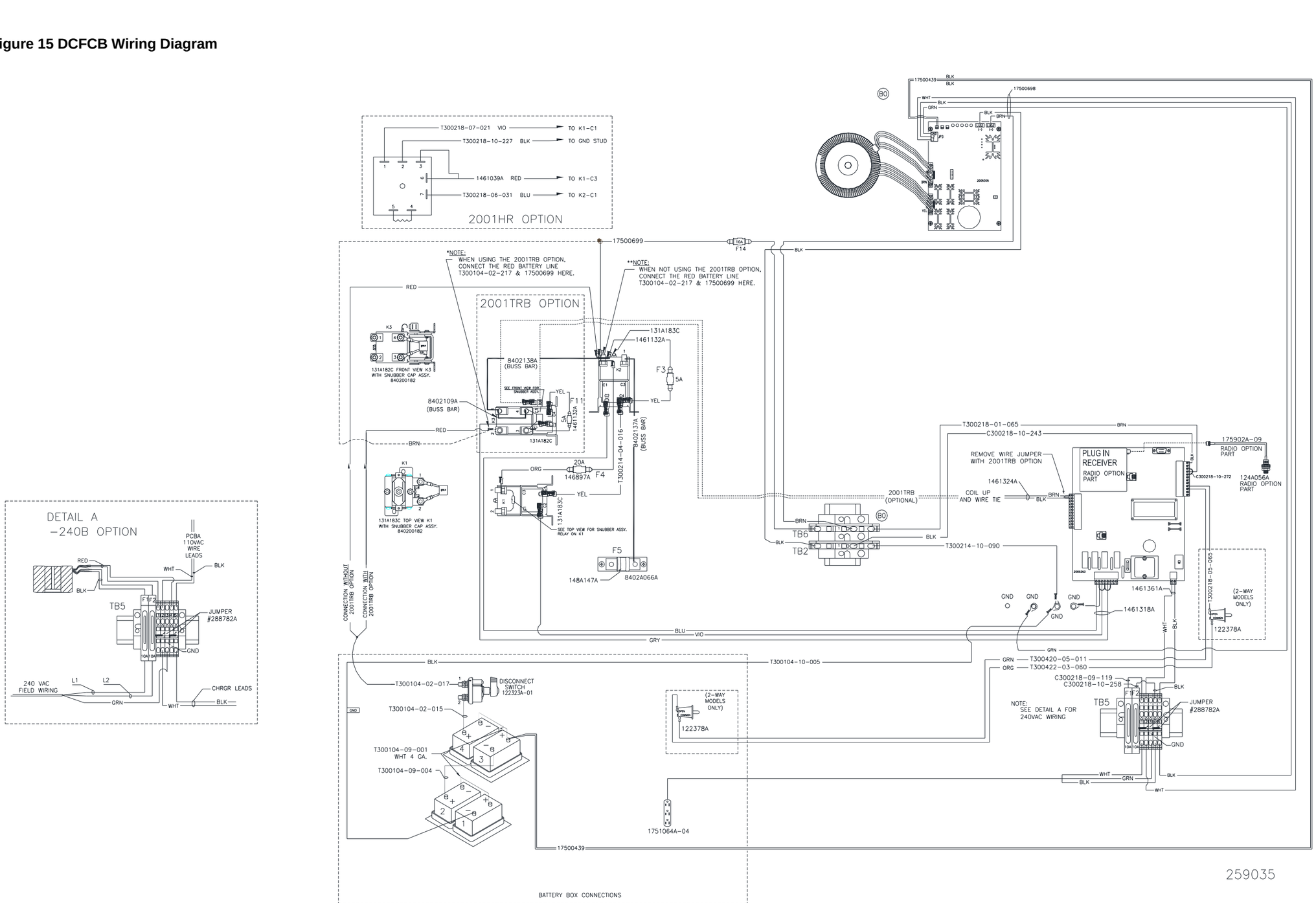


Figure 16 DCFCTB Wiring Diagram

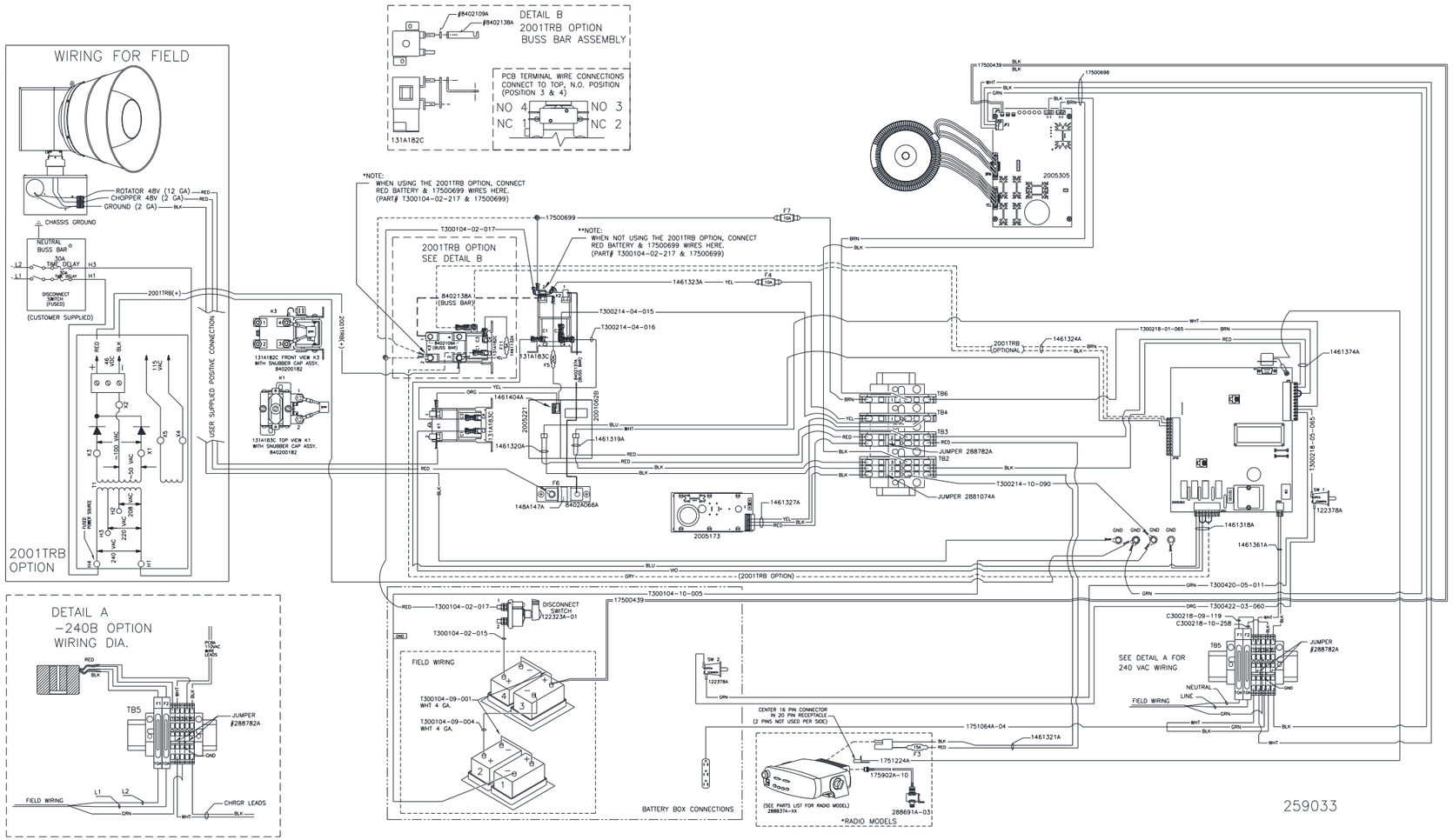


Figure 17 DCB and DCFCB Solar Wiring

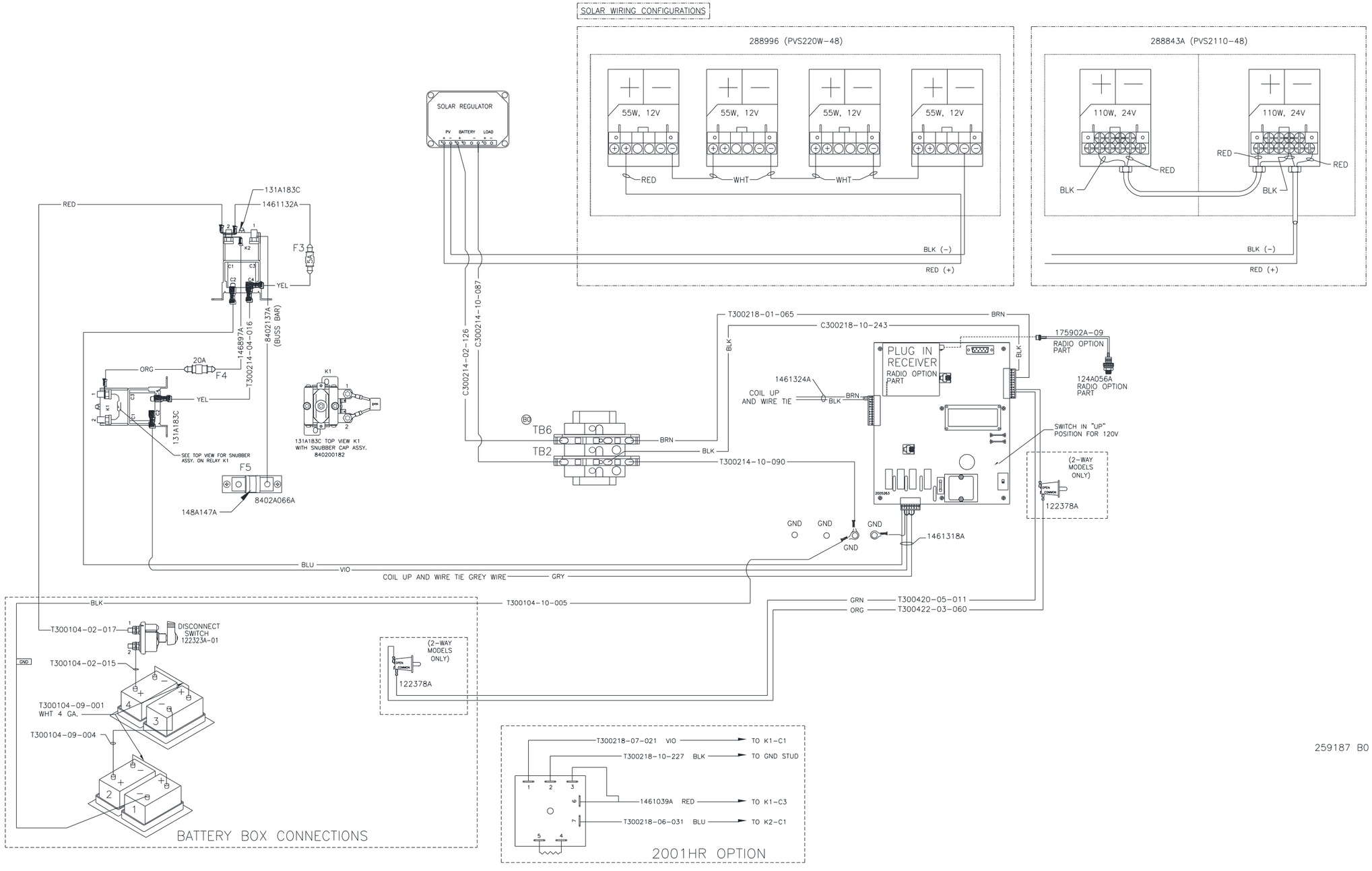


Figure 18 DCFCTB Solar Wiring

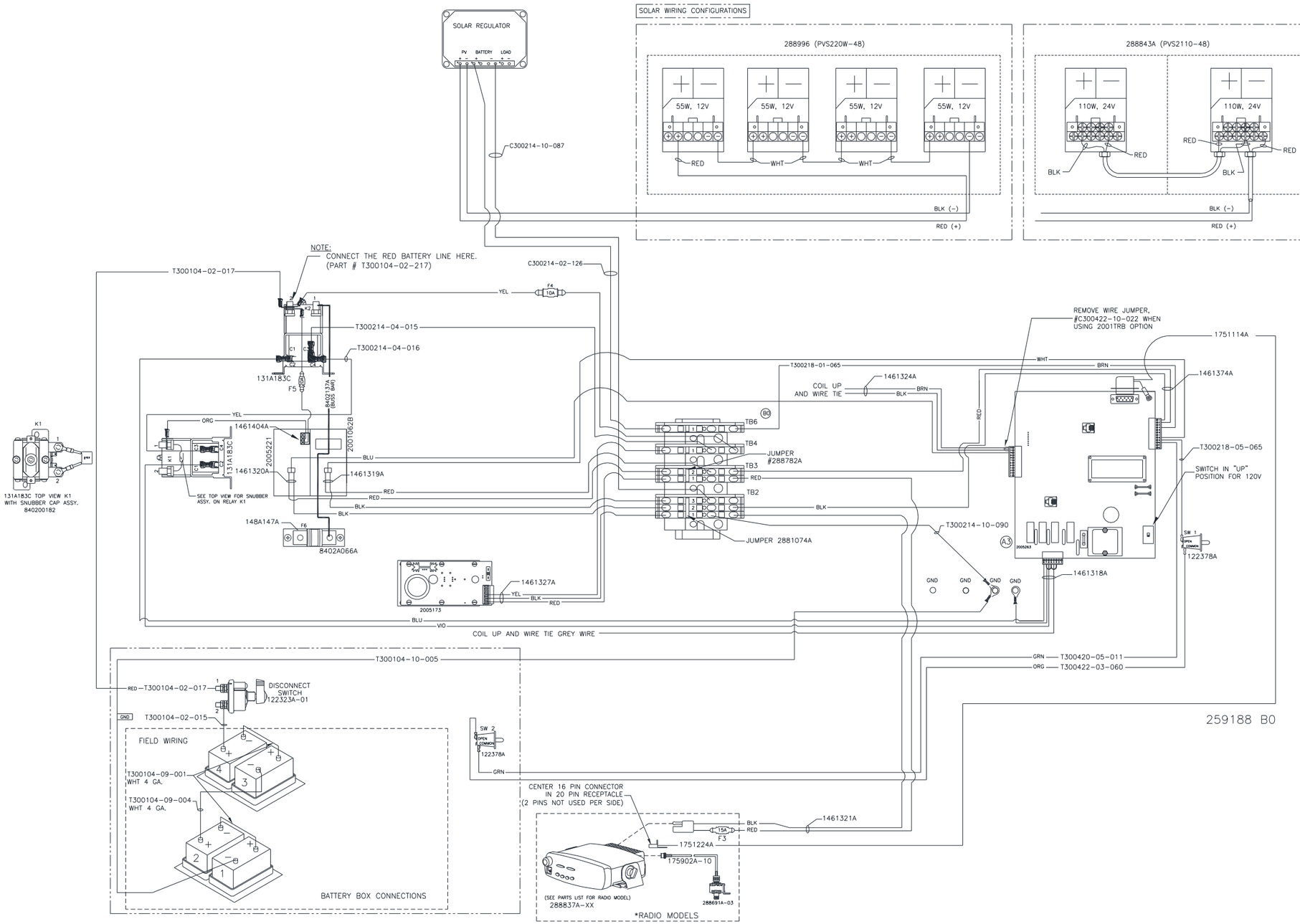
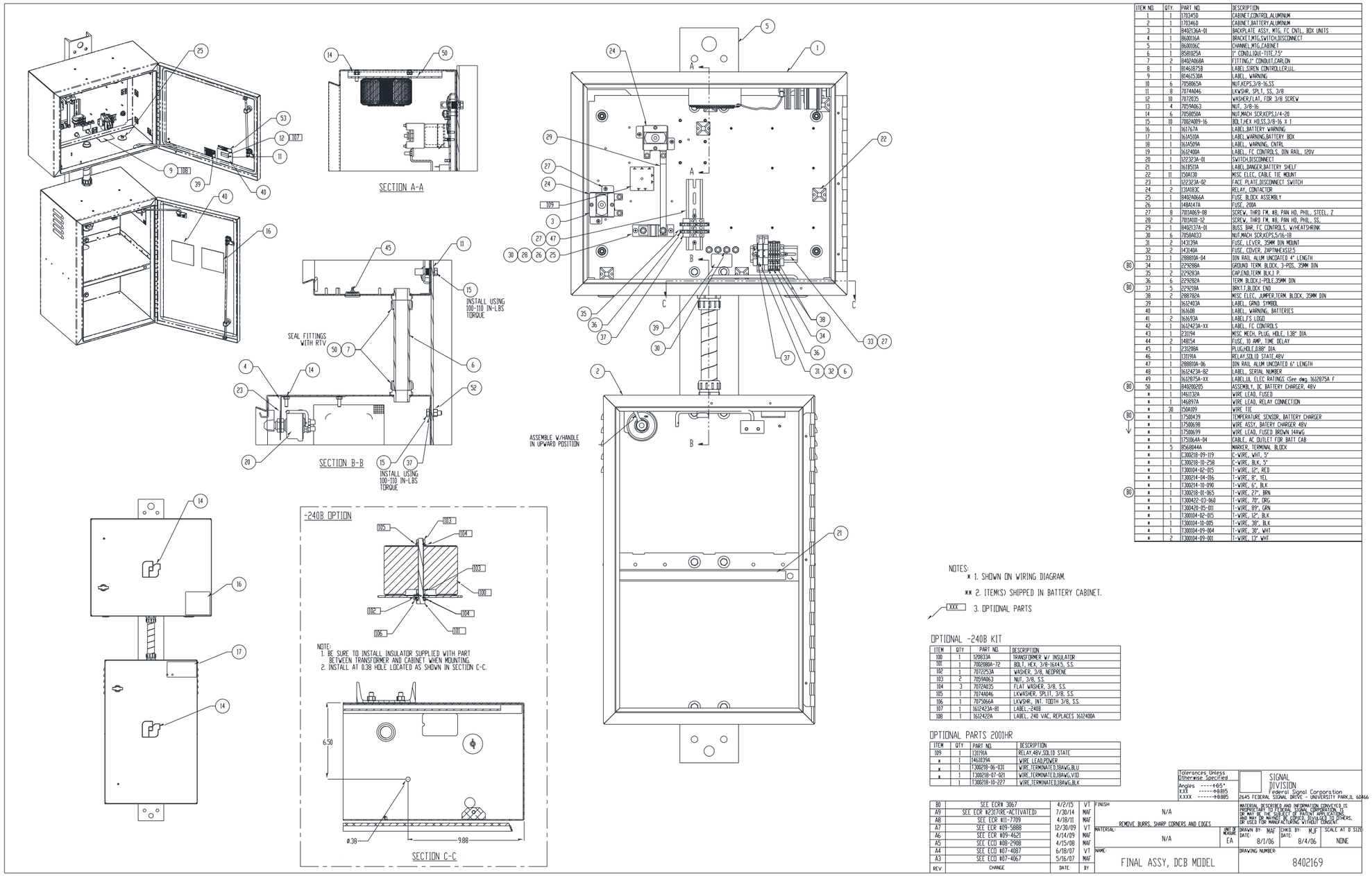


Figure 19 DCB Final Assembly



ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	1703450	CABINET,CONTROL,ALUMINUM
2	1	1703468	CABINET,BATTERY,ALUMINUM
3	1	8402136A-01	BACKPLATE ASSY, MTG, FC CNTL, BOX UNITS
4	1	8600116A	BRACKET,MTG,SWITCH,DISCONNECT
5	1	8600106C	CHANNEL,MTG,CABINET
6	1	8501025A	1" COND.LQUI-TITE,75'
7	2	8402A868A	FITTING,1" CONDUIT,CARLON
8	1	814638758	LABEL,SIREN CONTROLLER,UL
9	1	814615308	LABEL, WARNING
10	6	7058865A	NUT,KEPS,3/8-16,SS
11	8	7074A046	LKWSHR, SPLT, SS, 3/8
12	10	7072835	WASHER,FLAT, FOR 3/8 SCREW
13	4	70594863	NUT, 3/8-16
14	6	7058858A	NUT,MACH SCR,KEPS,1/4-28
15	10	70604089-16	BOLT,HEX HD,SS,3/8-16 X 1
16	1	161767A	LABEL,BATTERY WARNING
17	1	1614510A	LABEL,WARNING,BATTERY BOX
18	1	1614509A	LABEL, WARNING, CNTRL
19	1	1612400A	LABEL, FC CONTROLS, DIN RAIL, 120V
20	1	1223231-01	SWITCH,DISCONNECT
21	1	1618511A	LABEL,DANGER,BATTERY SHELF
22	11	1504130	MISC ELEC, CABLE TIE MOUNT
23	1	122323A-02	FACE PLATE,DISCONNECT SWITCH
24	2	131A183C	RELAY, CONTACTOR
25	1	8402A866A	FUSE BLOCK ASSEMBLY
26	1	148A147A	FUSE, 200A
27	8	7011A069-08	SCREW, THRD FM, #8, PAN HD, PHIL, STEEL, Z
28	2	7011A101-12	SCREW, THRD FM, #8, PAN HD, PHIL, SS,
29	1	8402137A-01	BUSS BAR, FC CONTROLS, W/HEATSHRINK
30	6	70594033	NUT,MACH SCR,KEPS,5/16-18
31	2	143139A	FUSE, LEVER, 35MM DIN MOUNT
32	2	143140A	FUSE, COVER, ZAPTHEXS12-5
33	1	2888104-04	DIN RAIL ALUM UNCDATED 4" LENGTH
80 34	1	2292188A	GROUND TERM BLOCK, 3-POS, 35MM DIN
35	2	2292183A	CAP,END,TERM BLK,I P,
36	6	2292182A	TERM BLOCK,1-POLE,35MM DIN
80 37	5	2292181A	BRKT,BLOCK END
38	2	2887182A	MISC ELEC, JUMPER,TERM BLOCK, 35MM DIN
39	1	1612403A	LABEL, GRND SYMBOL
40	1	161688	LABEL, WARNING, BATTERIES
41	2	1616593A	LABEL,FS LOGO
42	1	1612423A-XX	LABEL, FC CONTROLS
43	1	231194	MISC MECH, PLUG, HOLE, 1.38" DIA.
44	2	148154	FUSE, 10 AMP, TIME DELAY
45	1	231208A	PLUG,HOLE,0.88" DIA
46	1	131191A	RELAY,STD,ID STATE,48V
47	1	2888104-06	DIN RAIL ALUM UNCDATED 6" LENGTH
48	1	1612423A-02	LABEL, SERIAL NUMBER
49	1	1612875A-XX	LABEL,UL ELEC RATINGS (See dwg. 1612875A f
80 50	1	8402002D5	ASSEMBLY, DC BATTERY CHARGER, 48V
x	1	1461130A	WIRE LEAD, FUSED
x	1	1468917A	WIRE LEAD, RELAY CONNECTION
x	36	1504109	WIRE TIE
80 x	1	17500439	TEMPERATURE SENSOR, BATTERY CHARGER
x	1	17500698	WIRE ASSY, BATERY CHARGER 48V
x	1	17500699	WIRE LEAD, FUSED BROWN 14AWG
x	1	1751064A-04	CABLE, AC OUTLET FOR BATT CAB
x	5	8568044A	MARKER, TERMINAL BLOCK
x	1	C300218-09-119	C-WIRE, WHT, 5'
x	1	C300218-10-258	C-WIRE, BLK, 5'
x	1	T300104-02-015	T-WIRE, 12", RED
x	1	T300214-04-016	T-WIRE, 8", YEL
x	1	T300214-16-990	T-WIRE, 6", BLK
80 x	1	T300218-01-065	T-WIRE, 27", BRN
x	1	T300422-03-060	T-WIRE, 70", ORG
x	1	T300420-05-011	T-WIRE, 89", GRN
x	1	T300104-02-015	T-WIRE, 12", BLK
x	1	T300104-10-005	T-WIRE, 38", BLK
x	1	T300104-09-004	T-WIRE, 36", WHT
x	2	T300104-09-001	T-WIRE, 13" WHT

NOTES:
x 1. SHOWN ON WIRING DIAGRAM.
xx 2. ITEM(S) SHIPPED IN BATTERY CABINET.
XXX 3. OPTIONAL PARTS

OPTIONAL -240B KIT

ITEM	QTY	PART NO.	DESCRIPTION
100	1	1208833A	TRANSFORMER W/ INSULATOR
101	1	7082888A-72	BOLT, HEX, 3/8-16X4.5, S.S.
102	1	70722533A	WASHER, 3/8, NEOPRENE
103	2	70594063	NUT, 3/8, S.S.
104	3	7072A035	FLAT WASHER, 3/8, S.S.
105	1	7074A046	LKWASHER, SPLIT, 3/8, S.S.
106	1	7075066A	LKWSHR, INT. TOOTH 3/8, S.S.
107	1	1612423A-81	LABEL,-240B
108	1	1612422A	LABEL, 240 VAC, REPLACES 1612400A

OPTIONAL PARTS 2001HR

ITEM	QTY	PART NO.	DESCRIPTION
109	1	131191A	RELAY,48V,SOLID STATE
x	1	T4618394	WIRE LEAD,POWER
x	1	T300218-06-031	WIRE,TERMINATED,18AWG,BLU
x	1	T300218-07-021	WIRE,TERMINATED,18AWG,VIO
x	1	T300218-10-227	WIRE,TERMINATED,18AWG,BLK

REV	CHANGE	DATE	BY
B0	SEE ECR# 3867	4/27/15	VT
A9	SEE ECR #2317(RE-ACTIVATED)	7/30/14	MAF
A8	SEE ECR #11-7709	4/18/11	MAF
A7	SEE ECR #09-5888	12/30/09	VT
A6	SEE ECR #09-4621	4/14/09	MAF
A5	SEE ECO #08-2908	4/15/08	MAF
A4	SEE ECO #07-4087	6/18/07	VT
A3	SEE ECO #07-4067	5/16/07	MAF

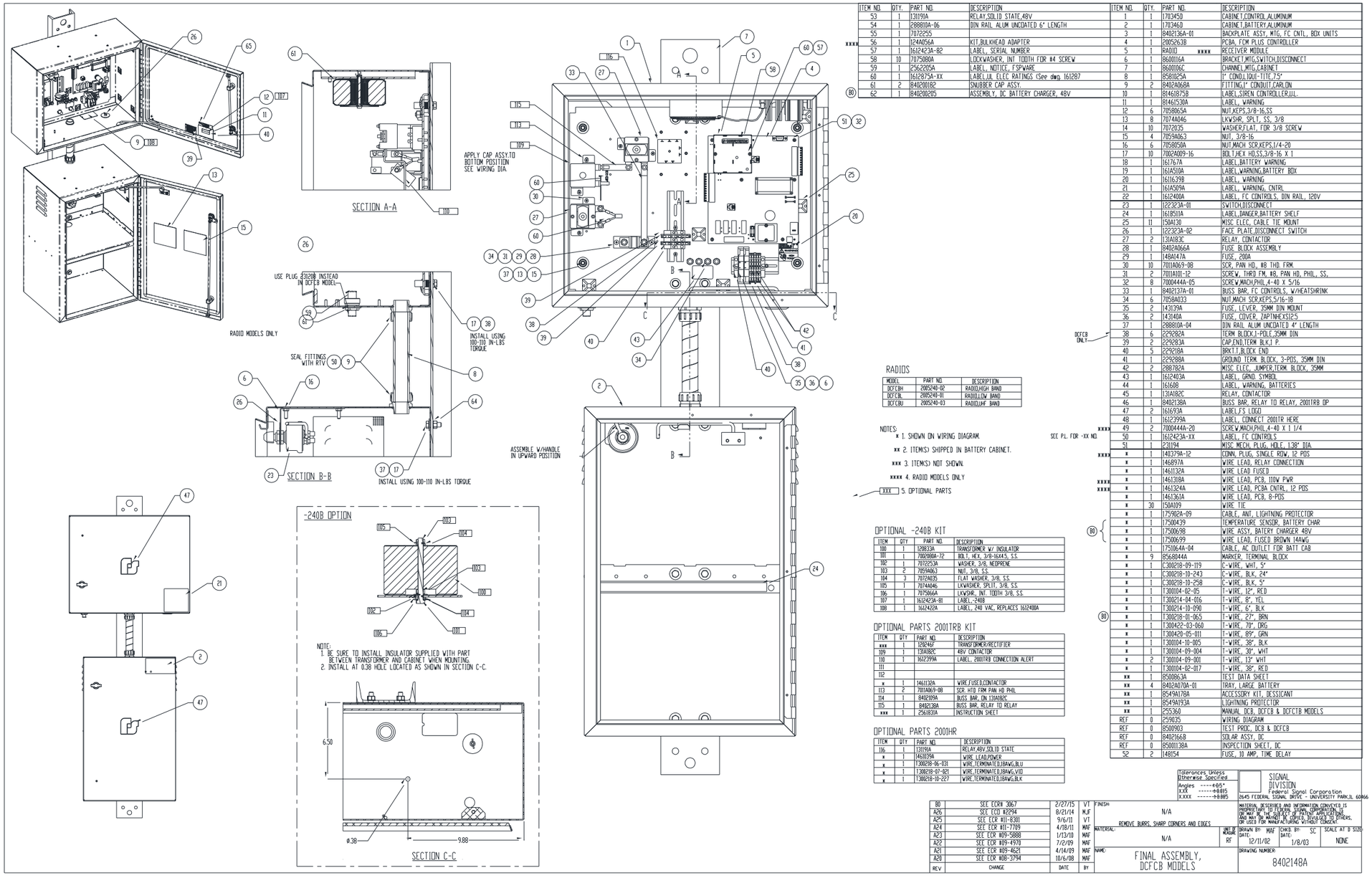
FINISH: N/A
REMOVE BURRS, SHARP CORNERS AND EDGES
MATERIAL: N/A
UNIT OF MEASURE: EA
NAME: FINAL ASSY, DCB MODEL

Tolerances Unless Otherwise Specified
Angles ----- ±0.5°
X.XX ----- ±0.015
X.XXX ----- ±0.005

SIGNAL DIVISION
Federal Signal Corporation
2645 FEDERAL SIGNAL DRIVE - UNIVERSITY PARK,IL 60466

DRAWN BY: MAF DATE: 8/1/06
CHKD BY: MJF DATE: 8/4/06
SCALE AT D SIZE: NONE
DRAWING NUMBER: 8402169

Figure 20 DCFCB Final Assembly



ITEM NO.	QTY.	PART NO.	DESCRIPTION
53	1	131191A	RELAY,SOLID STATE,48V
54	1	288810A-06	DIN RAIL ALUM UNCDATED 6" LENGTH
55	1	7072255	
xxxx 56	1	124A056A	KIT,BULKHEAD ADAPTER
57	1	1612423A-82	LABEL, SERIAL NUMBER
58	10	7075080A	LOCKWASHER, INT TOOTH FOR #4 SCREW
59	1	2562205A	LABEL, NOTICE, FSPWARE
60	1	1612875A-XX	LABEL,UL ELEC RATINGS (See dwg. 161287
61	2	8402008B2	SNUBBER CAP ASSY.
62	1	8402008D5	ASSEMBLY, DC BATTERY CHARGER, 48V

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	1703450	CABINET,CONTROL,ALUMINUM
2	1	1703460	CABINET,BATTERY,ALUMINUM
3	1	8402136A-01	BACKPLATE ASSY, WTG, FC CNTL, BOX UNITS
4	1	2005263B	PCBA, FCM PLUS CONTROLLER
5	1	RA0111 xxxx	RECEIVER MODULE
6	1	8600116A	BRACKET,MTG,SWITCH,DISCONNECT
7	1	8600106C	CHANNEL,MTG,CABINET
8	1	8581025A	1" COND.,LIQUI-TITE,7.5"
9	2	8402A068A	FITTING,1" CONDUIT,CARLON
10	1	8461B758	LABEL,SIREN CONTROLLER,UL.
11	1	8146153DA	LABEL, WARNING
12	6	7058065A	NUT,KEPS,3/8-16,SS
13	8	7074A046	LK.WSHR, SPLT, SS, 3/8
14	10	7072035	WASHER,FLAT, FOR 3/8 SCREW
15	4	7059A063	NUT, 3/8-16
16	6	7058050A	NUT,MACH SCR,KEPS,1/4-20
17	10	70824099-16	BOLT,HEX HD,SS,3/8-16 X 1
18	1	161767A	LABEL,BATTERY WARNING
19	1	161A510A	LABEL,WARNING,BATTERY BOX
20	1	1611639B	LABEL, WARNING
21	1	161A509A	LABEL, WARNING, CNTRL
22	1	1612400A	LABEL, FC CONTROLS, DIN RAIL, 120V
23	1	122323A-01	SWITCH,DISCONNECT
24	1	161B51A	LABEL,DANGER,BATTERY SHELF
25	11	150A130	MISC ELEC, CABLE TIE MOUNT
26	1	122323A-82	FACE PLATE,DISCONNECT SWITCH
27	2	131A183C	RELAY, CONTACTOR
28	1	8402A066A	FUSE BLOCK ASSEMBLY
29	1	148A147A	FUSE, 200A
30	10	7011A069-08	SCR, PAN HD, #8 THD FRM
31	2	7011A101-12	SCREW, THRD FM, #8, PAN HD, PHIL, SS,
32	8	7000444A-05	SCREW,MACH,PHIL,4-40 X 5/16
33	1	8402137A-01	BUSS BAR, FC CONTROLS, W/HEATSHRINK
34	6	7058A033	NUT,MACH SCR,KEPS,5/16-18
35	2	143139A	FUSE, LEVER, 35MM DIN MOUNT
36	2	143140A	FUSE, COVER, ZAPTNHEKSIE5
37	1	288810A-04	DIN RAIL ALUM UNCDATED 4" LENGTH
38	6	229282A	TERM BLOCK,1-POLE,35MM DIN
39	2	229283A	CAP,END,TERM BLK,I.P.
40	5	229218A	BRKT,T,BLOCK END
41	1	229288A	GROUND TERM. BLOCK, 3-POS, 35MM DIN
42	2	288782A	MISC ELEC, JUMPER,TERM. BLOCK, 35MM
43	1	1612403A	LABEL, GRND. SYMBOL
44	1	161680	LABEL, WARNING, BATTERIES
45	1	131A182C	RELAY, CONTACTOR
46	1	8402138A	BUSS BAR, RELAY TO RELAY, 2001TRB DP
47	2	161693A	LABEL,FS LOGO
48	1	1612399A	LABEL, CONNECT 2001TR HERE
xxxx 49	2	7000444A-20	SCREW,MACH,PHIL,4-40 X 1 1/4
50	1	1612423A-XX	LABEL, FC CONTROLS
51	1	23119A	MISC MECH, PLUG, HOLE, 1.38" DIA.
xxxx x	1	140279A-12	CONN, PLUG, SINGLE ROW, 12 POS
x	1	146897A	WIRE LEAD, RELAY CONNECTION
x	1	1461132A	WIRE LEAD FUSED
xxxx x	1	1461318A	WIRE LEAD, PCB, 110W PWR
xxxx x	1	1461324A	WIRE LEAD, PCBA CNTRL, 12 POS
x	1	1461361A	WIRE LEAD, PCB, 8-POS
x	30	150A109	WIRE TIE
x	1	175902A-09	CABLE, ANT, LIGHTNING PROTECTOR
x	1	17500439	TEMPERATURE SENSOR, BATTERY CHAR
x	1	17500698	WIRE ASSY, BATERY CHARGER 48V
x	1	17500699	WIRE LEAD, FUSED BROWN 14AWG
x	1	175106A-04	CABLE, AC OUTLET FOR BATT CAB
x	9	8568044A	MARKER, TERMINAL BLOCK
x	1	C300218-09-119	C-WIRE, WHT, 5'
x	1	C300218-10-243	C-WIRE, BLK, 24"
x	1	C300218-10-258	C-WIRE, BLK, 5'
x	1	T300104-02-05	T-WIRE, 12", RED
x	1	T300214-04-016	T-WIRE, 8", YEL
x	1	T300214-10-090	T-WIRE, 6", BLK
x	1	T300218-01-065	T-WIRE, 27", BRN
x	1	T300422-03-060	T-WIRE, 70", ORG
x	1	T300420-05-011	T-WIRE, 89", GRN
x	1	T300104-10-005	T-WIRE, 38", BLK
x	1	T300104-09-004	T-WIRE, 30", WHT
x	2	T300104-09-901	T-WIRE, 13" WHT
x	1	T300104-02-017	T-WIRE, 38", RED
xx	1	8500863A	TEST DATA SHEET
xx	4	8402A070A-01	TRAY, LARGE BATTERY
xx	1	8549A178A	ACCESSORY KIT, DESSICANT
xx	1	8549A193A	LIGHTNING PROTECTOR
xx	1	255360	MANUAL, DCB, DCFCB & DCFCTB MODELS
REF	0	229035	WIRING DIAGRAM
REF	0	8500903	TEST PROC, DCB & DCFCB
REF	0	8402166B	SOLAR ASSY, DC
REF	0	8500138A	INSPECTION SHEET, DC
52	2	148154	FUSE, 10 AMP, TIME DELAY

RADIOS

MODEL	PART NO	DESCRIPTION
DCFCBH	2005248-02	RADIO,HIGH BAND
DCFCBL	2005248-01	RADIO,LOW BAND
DCFCBU	2005248-03	RADIO,UHF BAND

NOTES:
x 1. SHOWN ON WIRING DIAGRAM.
xx 2. ITEM(S) SHIPPED IN BATTERY CABINET.
xxx 3. ITEM(S) NOT SHOWN.
xxxx 4. RADIO MODELS ONLY
XXX 5. OPTIONAL PARTS

SEE P.L. FOR -XX NO.

OPTIONAL -240B KIT

ITEM	QTY	PART NO.	DESCRIPTION
100	1	129833A	TRANSFORMER W/ INSULATOR
101	1	7002080A-72	BOLT, HEX, 3/8-16X4.5, S.S.
102	1	7072253A	WASHER, 3/8, NEOPRENE
103	2	7059A063	NUT, 3/8, S.S.
104	3	7072A035	FLAT WASHER, 3/8, S.S.
105	1	7074A046	LKWASHER, SPLIT, 3/8, S.S.
106	1	7075866A	LKWSHR, INT. TOOTH 3/8, S.S.
107	1	1612423A-81	LABEL,-240B
108	1	1612422A	LABEL, 240 VAC, REPLACES 1612408A

OPTIONAL PARTS 2001TRB KIT

ITEM	QTY	PART NO.	DESCRIPTION
xxx	1	129246F	TRANSFORMER/RECTIFIER
109	1	131A182C	48V CONTACTOR
110	1	1612399A	LABEL, 2001TRB CONNECTION ALERT
111			
112			
x	1	1461132A	WIRE,FUSED,CONTACTOR
113	2	7011A069-08	SCR, HTD FORM PAN HD PHIL
114	1	8402189A	BUSS BAR, DN 131A182C
115	1	8402138A	BUSS BAR, RELAY TO RELAY
xxx	1	2561831A	INSTRUCTION SHEET

OPTIONAL PARTS 2001HR

ITEM	QTY	PART NO.	DESCRIPTION
116	1	131190A	RELAY,48V,SOLID STATE
x	1	1461039A	WIRE LEAD,POWER
x	1	T300218-06-031	WIRE,TERMINATE,0.18AWG,BLU
x	1	T300218-07-601	WIRE,TERMINATE,0.18AWG,VIO
x	1	T300218-10-227	WIRE,TERMINATE,0.18AWG,BLK

B0	SEE ECR# 3867	2/27/15	VT
A25	SEE ECO #2294	8/21/14	MJF
A25	SEE ECR #11-8301	9/6/11	VT
A24	SEE ECR #11-7709	4/18/11	MAF
A23	SEE ECR #09-5888	1/13/10	MAF
A22	SEE ECR #09-4970	7/2/09	MAF
A21	SEE ECR #09-4621	4/14/09	MAF
A20	SEE ECR #08-3794	10/6/08	MAF
REV	CHANGE	DATE	BY

Tolerances Unless Otherwise Specified
Angles ----±0.5°
X.XX ----±0.005
X.XXX ----±0.005

SIGNAL DIVISION
Federal Signal Corporation
2645 FEDERAL SIGNAL DRIVE - UNIVERSITY PARK,IL 60466

FINISH: N/A
REMOVE BURRS, SHARP CORNERS AND EDGES

MATERIAL: N/A
UNIT OF MEASURE: RF

NAME: FINAL ASSEMBLY, DCFCB MODELS

DRAWN BY: MAF DATE: 12/11/02
CHKD. BY: SC DATE: 1/8/03
SCALE AT 'B' SIZE: NONE

DRAWING NUMBER: 8402148A

Figure 21 DCFCTB-IP Wiring Diagram

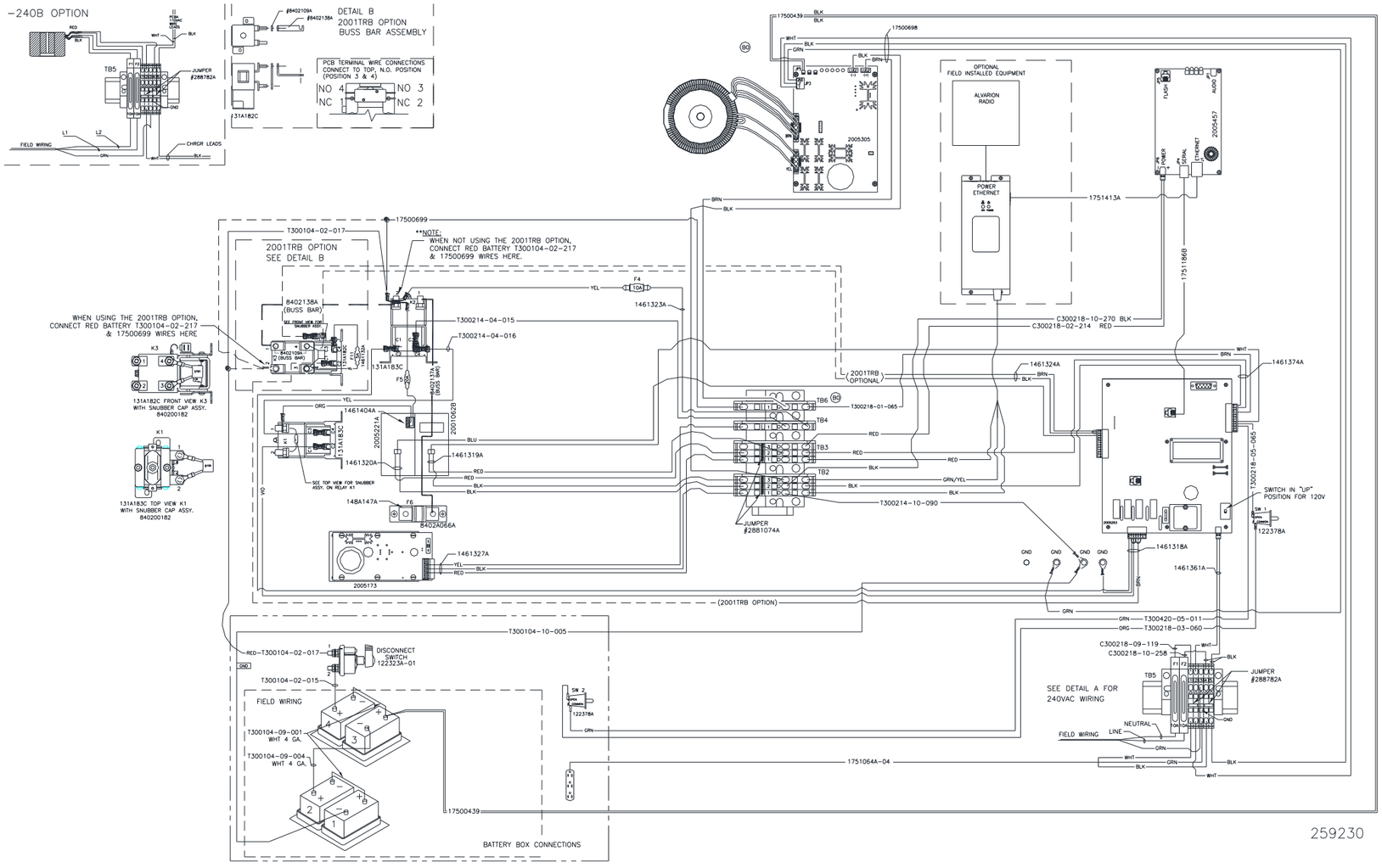
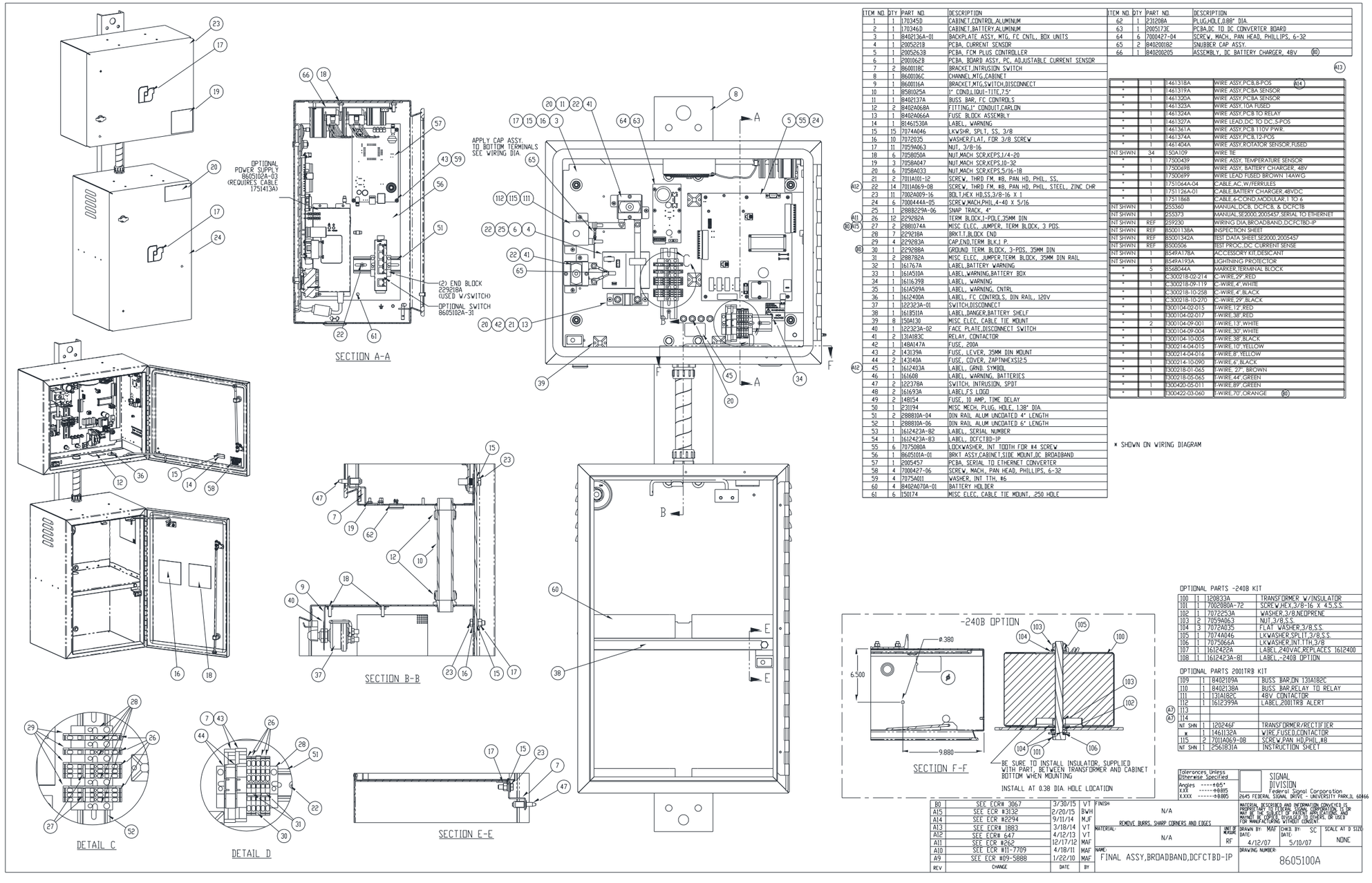


Figure 22 DCFCTB-IP Final Assembly



ITEM NO.	QTY	PART NO.	DESCRIPTION
1	1	1703450	CABINET,CONTROL,ALUMINUM
2	1	1703460	CABINET,BATTERY,ALUMINUM
3	1	8402136A-01	BACKPLATE ASSY, MTG, FC CNTL, BOX UNITS
4	1	2005221B	PCBA, CURRENT SENSOR
5	1	2005263B	PCBA, FCM PLUS CONTROLLER
6	1	2001062B	PCBA, BOARD ASSY, PC, ADJUSTABLE CURRENT SENSOR
7	2	8600118C	BRACKET,INTRUSION SWITCH
8	1	8600106C	CHANNEL,MTG,CABINET
9	1	8600116A	BRACKET,MTG,SWITCH,DISCONNECT
10	1	8581025A	1" CONDU,IQUI-TITE,7.5"
11	1	8402137A	BUSS BAR, FC CONTROLS
12	2	8402A068A	FITTING,1" CONDUIT,CARLON
13	1	8402A066A	FUSE BLOCK ASSEMBLY
14	1	81461530A	LABEL, WARNING
15	15	70744046	LKWSHR, SPLT, SS, 3/8
16	10	7072035	WASHER,FLAT, FOR 3/8 SCREW
17	11	7059A063	NUT, 3/8-16
18	6	7058050A	NUT,MACH SCR,KEPS,1/4-20
19	3	7058A047	NUT,MACH SCR,KEPS,10-32
20	6	7058A033	NUT,MACH SCR,KEPS,5/16-18
21	2	7011A101-12	SCREW, THRD FM, #8, PAN HD, PHIL, SS,
22	14	7011A069-08	SCREW, THRD FM, #8, PAN HD, PHIL, STEEL, ZINC CHR
23	11	7002A099-16	BOLT,HEX HD,SS,3/8-16 X 1
24	6	7004444-05	SCREW,MACH,PHIL,4-40 X 5/16
25	1	2888229A-06	SNAP TRACK, 4"
A11 26	12	229282A	TERM BLOCK,1-POLE,35MM DIN
80 A15 27	2	2881074A	MISC ELEC, JUMPER, TERM BLOCK, 3 PDS.
28	7	229218A	BRKT,T,BLOCK END
29	4	229283A	CAP,END,TERM BLK,1 P.
80 30	1	229288A	GROUND TERM BLOCK, 3-PDS, 35MM DIN
31	2	288782A	MISC ELEC, JUMPER,TERM BLOCK, 35MM DIN RAIL
32	1	161767A	LABEL,BATTERY WARNING
33	1	161A510A	LABEL,WARNING,BATTERY BOX
34	1	16116 29B	LABEL, WARNING
35	1	161A509A	LABEL, WARNING, CNTRL
36	1	1612400A	LABEL, FC CONTROLS, DIN RAIL, 120V
37	1	122323A-01	SWITCH,DISCONNECT
38	1	161B511A	LABEL,DANGER,BATTERY SHELF
39	8	150A130	MISC ELEC, CABLE TIE MOUNT
40	1	122323A-02	FACE PLATE,DISCONNECT SWITCH
41	2	131A183C	RELAY, CONTACTOR
42	1	148A147A	FUSE, 200A
43	2	143139A	FUSE, LEVER, 35MM DIN MOUNT
44	2	143140A	FUSE, COVER, ZAPTHEXSI2.5
A12 45	1	1612403A	LABEL, GRND. SYMBOL
46	1	161618	LABEL, WARNING, BATTERIES
47	2	122378A	SWITCH, INTRUSION, SPDT
48	2	161693A	LABEL,FS LOGO
49	2	148154	FUSE, 10 AMP, TIME DELAY
50	1	231194	MISC MECH, PLUG, HOLE, 1.38" DIA.
51	2	288810A-04	DIN RAIL ALUM UNCDATED 4" LENGTH
52	1	288810A-06	DIN RAIL ALUM UNCDATED 6" LENGTH
53	1	1612423A-82	LABEL, SERIAL NUMBER
54	1	1612423A-83	LABEL, DCFCTBD-IP
55	6	7075080A	LOCKWASHER, INT TOOTH FOR #4 SCREW
56	1	8605101A-01	BRKT ASSY,CABINET,SIDE MOUNT,DC BROADBAND
57	1	2005457	PCBA, SERIAL TO ETHERNET CONVERTER
58	4	7000427-06	SCREW, MACH, PAN HEAD, PHILLIPS, 6-32
59	4	7075A011	WASHER, INT. TTH, #6
60	4	8402A070A-01	BATTERY HOLDER
61	6	150174	MISC ELEC, CABLE TIE MOUNT, .250 HOLE

ITEM NO.	QTY	PART NO.	DESCRIPTION
62	1	231208A	PLUG,HOLE,0.88" DIA.
63	1	2005173E	PCBA,DC TO DC CONVERTER BOARD
64	6	7000427-04	SCREW, MACH., PAN HEAD, PHILLIPS, 6-32
65	2	84020018Z	SNUBBER CAP ASSY.
66	1	8402002O5	ASSEMBLY, DC BATTERY CHARGER, 48V (80)

A13

*	1	1461318A	WIRE ASSY,PCB,8-POS (A14)
*	1	1461319A	WIRE ASSY,PCBA SENSOR
*	1	1461320A	WIRE ASSY,PCBA SENSOR
*	1	1461323A	WIRE ASSY,10A FUSED
*	1	1461324A	WIRE ASSY,PCB TO RELAY
*	1	1461327A	WIRE LEAD,DC TO DC,5-POS
*	1	1461361A	WIRE ASSY,PCB 110V PWR.
*	1	1461374A	WIRE ASSY,PCB,12-POS
*	1	1461404A	WIRE ASSY,ROTATOR SENSOR,FUSED
NT SHWN	34	150A109	WIRE TIE
*	1	17500439	WIRE ASSY, TEMPERATURE SENSOR
*	1	17500698	WIRE ASSY, BATTERY CHARGER, 48V
*	1	17500699	WIRE LEAD FUSED BROWN 14AWG
*	1	1751064A-04	CABLE,AC W/FERRULES
*	1	1751126A-01	CABLE,BATTERY CHARGER,48VDC
*	1	17511868	CABLE,6-COND,MODULAR,1 TO 6
NT SHWN	1	255360	MANUAL,DCB, DCFCTB, & DCFCTB
NT SHWN	1	255373	MANUAL,SE2000,2005457,SERIAL TO ETHERNET
NT SHWN	REF	259230	WIRING DIA,BROADBAND,DCFCTBD-IP
NT SHWN	REF	B500138A	INSPECTION SHEET
NT SHWN	REF	B5001342A	TEST DATA SHEET,SE2000,2005457
NT SHWN	REF	B500506	TEST PROC.,DC CURRENT SENSE
NT SHWN	1	B549A178A	ACCESSORY KIT,DESICANT
NT SHWN	1	B549A193A	LIGHTNING PROTECTOR
*	5	B568044A	MARKER,TERMINAL BLOCK
*	1	C-300218-02-214	C-WIRE,29",RED
*	1	C-300218-09-119	C-WIRE,4",WHITE
*	1	C-300218-10-258	C-WIRE,4",BLACK
*	1	C-300218-10-270	C-WIRE,29",BLACK
*	1	T-300104-02-015	T-WIRE,12",RED
*	1	T-300104-02-017	T-WIRE,38",RED
*	2	T-300104-09-001	T-WIRE,13",WHITE
*	1	T-300104-09-004	T-WIRE,30",WHITE
*	1	T-300104-10-005	T-WIRE,38",BLACK
*	1	T-300214-04-015	T-WIRE,10",YELLOW
*	1	T-300214-04-016	T-WIRE,8",YELLOW
*	1	T-300214-10-090	T-WIRE,6",BLACK
*	1	T-300218-01-065	T-WIRE, 27", BROWN
*	1	T-300218-05-065	T-WIRE,44",GREEN
*	1	T-300428-05-011	T-WIRE,89",GREEN
*	1	T-300422-03-060	T-WIRE,70",ORANGE (80)

* SHOWN ON WIRING DIAGRAM

OPTIONAL PARTS -240B KIT

100	1	120833A	TRANSFORMER W/INSULATOR
101	1	7002080A-72	SCREW,HEX,3/8-16 X 4.5,S.S.
102	1	7072C53A	WASHER,3/8,NEOPRENE
103	2	7059A063	NUT,3/8,S.S.
104	3	7072A035	FLAT WASHER,3/8,S.S.
105	1	7074A046	LKWASHER,SPLIT,3/8,S.S.
106	1	7075066A	LKWASHER,INT.TTH,3/8
107	1	161242 2A	LABEL,240VAC,REPLACES 1612400
108	1	161242 3A-81	LABEL,-240B OPTION

OPTIONAL PARTS 2001TRB KIT

109	1	B402109A	BUSS BAR,ON 131A182C
110	1	B402138A	BUSS BAR,RELAY TO RELAY
111	1	131A182C	48V CONTACTOR
112	1	1612399A	LABEL,2001TRB ALERT
A7 113			
A7 114			
NT SHN	1	120246F	TRANSFORMER/RECTIFIER
*	1	146132A	WIRE,FUSED,CONTACTOR
115	2	7011A069-08	SCREW,PAN HD,PHIL #8
NT SHN	1	2561831A	INSTRUCTION SHEET

REV	CHANGE	DATE	BY
B0	SEE ECR# 3067	3/30/15	VT
A15	SEE ECR #3132	2/20/15	BWH
A14	SEE ECR #2294	9/11/14	MJF
A13	SEE ECR# 1883	3/18/14	VT
A12	SEE ECR# 647	4/12/13	VT
A11	SEE ECR #262	12/17/12	MAF
A10	SEE ECR #11-7709	4/18/11	MAF
A9	SEE ECR #09-5888	1/22/10	MAF

Tolerances Unless Otherwise Specified
Angles ----±05°
X.XX ------±0.015
X.XXX -----±0.005

SIGNAL DIVISION
Federal Signal Corporation
2645 FEDERAL SIGNAL DRIVE - UNIVERSITY PARK,IL 60466

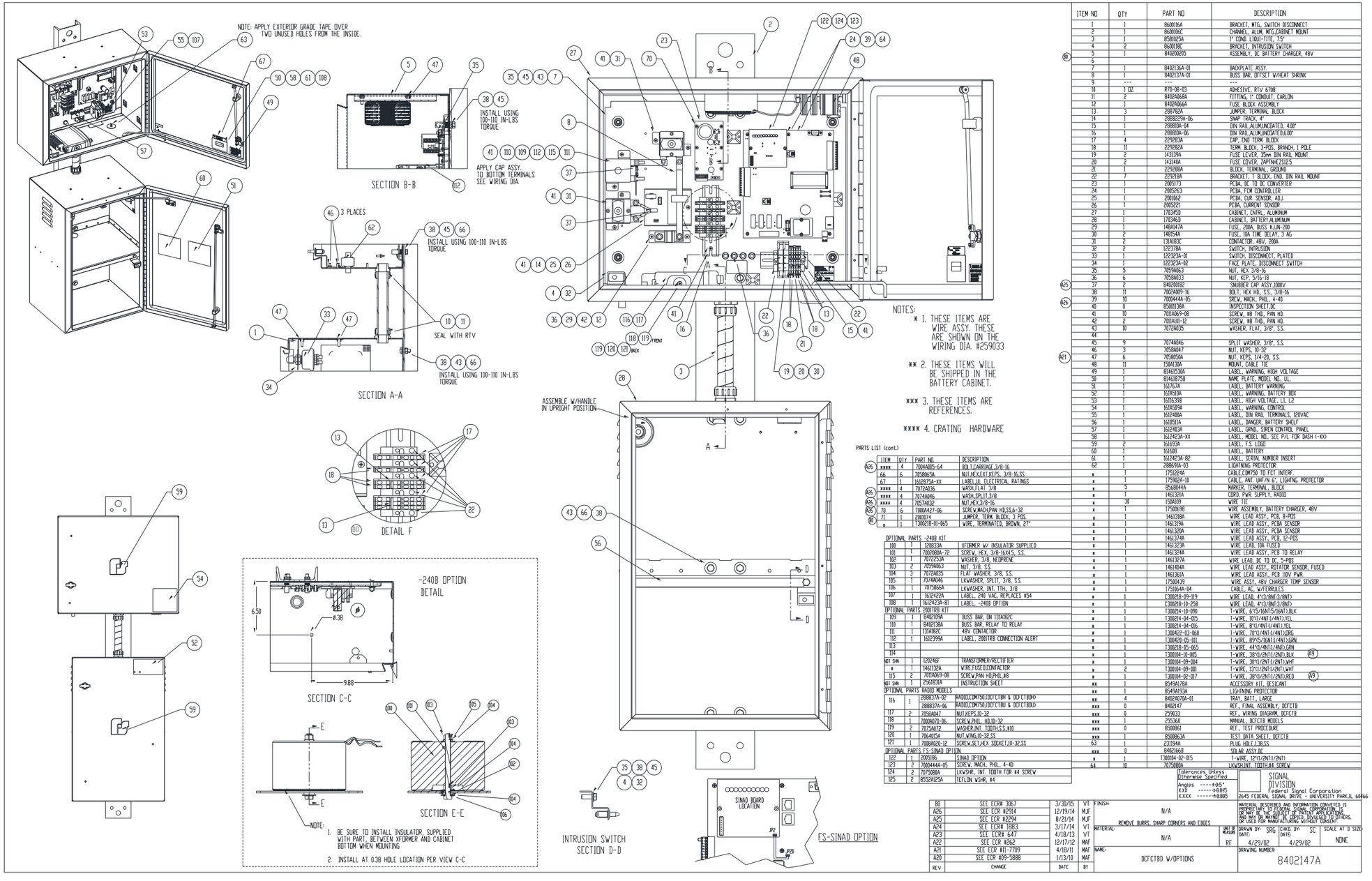
FINISH: N/A
REMOVE BURRS, SHARP CORNERS AND EDGES
MATERIAL: N/A
UNIT OF MEASURE: RF

MATERIAL DESCRIBED AND INFORMATION CONVEYED IS PROPRIETARY TO FEDERAL SIGNAL CORPORATION & IS OR MAY BE THE SUBJECT OF PATENT APPLICATIONS, AND MAY NOT BE COPIED, DISCLOSED TO OTHERS, OR USED FOR MANUFACTURING WITHOUT CONSENT

DRAWN BY: MAF DATE: 4/12/07
CHK'D BY: SC DATE: 5/10/07
SCALE: AT D SIZE: NONE

NAME: FINAL ASSY,BROADBAND,DCFCTBD-IP
DRAWING NUMBER: 8605100A

Figure 23 DCFCTB Final Assembly



ITEM NO	QTY	PART NO	DESCRIPTION
1	1	8600116A	BRACKET, MTG, SWITCH DISCONNECT
2	1	8600118C	CHANNEL, ALUM, MTG,CABINET MOUNT
3	1	8581825A	1" COND. LIQUI-TITE, 75'
4	2	8600118C	BRACKET, INTRUSION SWITCH
(B0) 5	1	8402082S	ASSEMBLY, BC BATTERY CHARGER, 48V
6			
7	1	8402136A-01	BACKPLATE ASSY.
8	1	8402137A-01	BUSS BAR, OFFSET W/HEAT SHRINK
9	----	----	----
10	1 OZ.	R70-08-03	ADHESIVE, RTV 6708
11	2	8402A068A	FITTING, 1" CONDUIT, CARLON
12	1	8402A066A	FUSE BLOCK ASSEMBLY
13	3	288782A	JUMPER, TERMINAL BLOCK
14	1	288822SA-06	SNAP TRACK, 4"
15	1	288810A-04	DIN RAIL,ALUM,UNCDATED, 4.00"
16	1	288810A-06	DIN RAIL,ALUM,UNCDATED,6.00"
17	4	229293A	CAP, END TERM BLOCK
18	11	229282A	TERM. BLOCK, 3-PDS, BRANCH, 1 POLE
19	2	143139A	FUSE LEVER, 35mm DIN RAIL MOUNT
20	2	143140A	FUSE COVER, ZAPTHKE2S2S
21	1	229288A	BLOCK TERMINAL, GROUND
22	7	229218A	BRACKET, 1 BLOCK END, DIN RAIL MOUNT
23	1	2805173	PCBA, BC TO BC CONVERTER
24	1	2805263	PCBA, TCM CONTROLLER
25	1	2801062	PCBA, CUR. SENSOR, ADJ.
26	1	2805221	PCBA, CURRENT SENSOR
27	1	1783451D	CABINET, CNTRL, ALUMINUM
28	1	1783461D	CABINET, BATTERY,ALUMINUM
29	1	148614TA	FUSE, 200A, BUSS K,LIN-200
30	2	148154A	FUSE, 10A TIME DELAY, 3 AG
31	2	13IA183C	CONTACTOR, 48V, 200A
32	2	122378A	SWITCH, INTRUSION
33	1	122323A-01	SWITCH, DISCONNECT, PLATED
34	1	122323A-02	FACE PLATE, DISCONNECT SWITCH
35	5	70594063	NUT, HEX 3/8-16
36	6	70586033	NUT, KEP, 5/16-18
(A25) 37	2	8402081BC	INSULATOR CAP ASSY.,1000V
38	11	70024089-16	BOLT, HEX HD, S.S., 3/8-16
(A24) 39	10	70004448-05	SREW, MACH, PHIL, 4-40
40	0	8580013BA	INSPECTION SHEET,DC
41	10	70114069-08	SCREW, #8 THD, PAN HD.
42	2	70114101-12	SCREW, #8 THD, PAN HD.
43	10	70724035	WASHER, FLAT, 3/8", S.S.
44			
45	9	70744046	SPLIT WASHER, 3/8", S.S.
46	3	70586047	NUT, KEPS, 10-32
(A21) 47	6	70586050A	NUT, KEPS, 1/4-20, S.S.
48	11	159A139A	MOUNT, CABLE TIE
49	1	81463530A	LABEL, WARNING, HIGH VOLTAGE
50	1	8146187SB	NAME PLATE, MODEL NO, UL.
51	1	161767A	LABEL, BATTERY WARNING
52	1	163A510A	LABEL, WARNING, BATTERY BOX
53	1	161L639B	LABEL, HIGH VOLTAGE, L1, L2
54	1	163A589A	LABEL, WARNING, CONTROL
55	1	1632408A	LABEL, DIN RAIL TERMINALS, 120VAC
56	1	1618511A	LABEL, DANGER, BATTERY SHELF
57	1	1632483A	LABEL, GRND, SIREN CONTROL PANEL
58	1	1632423A-XX	LABEL, MODEL NO, SEE P/L FOR DASH (-XX)
59	2	1616793A	LABEL,T.S.1080
60	1	161688	LABEL, BATTERY
61	1	1632423A-B2	LABEL, SERIAL NUMBER INSERT
62	1	288619A-03	LIGHTNING PROTECTOR
x	1	175S324A	CABLE,CBM750 TO FCT INTERF.
x	1	175982A-10	CABLE, ANT. UHF/N 6', LIGHTNG. PROTECTOR
x	5	8568044A	MARKER, TERMINAL, BLOCK
x	1	1463321A	CORD, PWR. SUPPLY, RADIO
x	38	150A039	WIRE TIE
x	1	175006B	WIRE ASSEMBLY, BATTERY CHARGER, 48V
x	1	1463318A	WIRE LEAD ASSY., PCB, 8-PDS
x	1	1463319A	WIRE LEAD ASSY., PCBA SENSOR
x	1	1463320A	WIRE LEAD ASSY, PCBA SENSOR
x	1	1463374A	WIRE LEAD ASSY., PCB, 12-PDS
x	1	1463323A	WIRE LEAD, 10A FUSED
x	1	1463324A	WIRE LEAD ASSY., PCB TO RELAY
x	1	1463327A	WIRE LEAD, DC TO DC, 5-PDS
x	1	1464404A	WIRE LEAD ASSY., ROTATOR SENSOR, FUSED
x	1	1463361A	WIRE LEAD ASSY., PCB 110V PWR.
x	1	175B043F	WIRE ASSY, 48V CHARGER TEMP SENSOR
x	1	1731B644-04	CABLE, AC, W/FERRULES
x	1	C300218-09-119	WIRE LEAD, 4*(2/8NT3/8NT)
x	1	C300218-10-258	WIRE LEAD, 4*(2/8NT3/8NT)
x	1	1300214-10-090	T-WIRE, 6*(5/16NT5/16NT),BLK
x	1	1300214-04-015	T-WIRE, 10*(1/4NT1/4NT),YEL
x	1	1300214-04-016	T-WIRE, 8*(1/4NT1/4NT),YEL
x	1	1300422-03-060	T-WIRE, 70*(1/4NT1/4NT),ORG
x	1	1300420-05-011	T-WIRE, 85*(5/16NT1/4NT),GRN
x	1	1300218-05-1165	T-WIRE, 44*(1/4NT1/4NT),GRN
x	1	1300104-10-005	T-WIRE, 38*(1/2NT1/2NT),BLK (A9)
x	1	1300104-09-004	T-WIRE, 30*(1/2NT1/2NT),WHT
x	2	1300104-09-001	T-WIRE, 13*(1/2NT1/2NT),WHT
x	1	1300104-02-017	T-WIRE, 38*(1/2NT1/2NT),RED (A9)
xx	1	85494178A	ACCESSORY KIT, DCSICANT
xx	1	85494193A	LIGHTNING PROTECTOR
xx	4	8402A070A-01	TRAY, BATT., LARGE
xxx	0	8402147	REF., FINAL ASSEMBLY, DCFCTB
xxx	0	259033	REF., WIRING DIAGRAM, DCFCTB
xxx	1	255360	MANUAL, DCFCTB MODELS
xxx	0	8500861	REF., TEST PROCEDURE
xxx	1	8509863B	TEST DATA SHEET, DCFCTB
63	1	231194A	PLUG HOLE 1.38 SS
xxx	0	8482166B	SOLAR ASSY.DC
x	1	T300104-02-015	T-WIRE, 12*(1/2NT1/2NT)
64	10	7075088A	LKWSHR, TOOTH, #4, SCREW

PARTS LIST (cont.)

ITEM	QTY	PART NO.	DESCRIPTION
(A26) xxxx	4	7004A005-64	BOLT,CARRIAGE,3/8-16
66	6	70586054	NUT,HEX,EXT,KEPS, 3/8-16,SS
67	1	161297SA-XX	LABEL,UL ELECTRICAL RATINGS
(A26) xxxx	4	70724036	WASH,FLAT 3/8
(A26) xxxx	4	70744046	WASH,SPLIT,3/8
(A26) xxxx	4	70574032	NUT,HEX,3/8-16
(A26) 70	6	7000A427-06	SCREW,MACH,PAN HD,SS,6-32
(B0) 71	1	2801074	JUMPER, TERM. BLOCK, 3 POS.
x	1	T300218-01-865	WIRE, TERMINATED, BROWN, 2"

OPTIONAL PARTS -240B KIT

100	1	120833A	XFORMER W/ INSULATOR SUPPLIED
101	1	7005088A-72	SCREW, HEX, 3/8-16X4.5, S.S.
102	1	7072253A	WASHER, 3/8, NEOPRENE
103	2	70594063	NUT, 3/8, S.S.
104	3	70724035	FLAT WASHER, 3/8, S.S.
105	1	70744046	LKWASHER, SPLIT, 3/8, S.S.
106	1	7073866A	LKWASHER, INT. TTH, 3/8
107	1	1612422A	LABEL, 240 VAC, REPLACES #54
108	1	1612423A-B1	LABEL, -240B OPTION

OPTIONAL PARTS 2801118 KIT

109	1	8482109A	BUSS BAR, DN 13IA182C
110	1	8482138A	BUSS BAR, RELAY TO RELAY
111	1	13IA182C	48V CONTACTOR
112	1	T612395A	LABEL, 2801118 CONNECTION ALERT
113			
114			
NOT SHN	1	1202416F	TRANSFORMER/RECTIFIER
x	1	14613J2A	WIRE,FUSE,BLOWN,ACTUATOR
115	2	7011A069-08	SCREW,PAN HD,PHIL,#8
NOT SHN	1	256183EA	INSTRUCTION SHEET

OPTIONAL PARTS RADIO MODELS

116	1	C2888374-02	RADIO,CBM750,DCFCTBH & DCFCTBEH0
		2888374-B6	RADIO,CBM750,DCFCTBU & DCFCTBUD
117	2	7058A047	NUT,KEPS,10-32
118	1	7000A070-B6	SCREW,PHIL. HD,10-32
119	2	7075A072	WASHER,INT. TOOTH,S.S.,#10
120	1	7064A175A	NUT,WING,10-32,SS
121	1	7088A820-12	SCREW,SET,HEX SOCKET,10-32,SS

OPTIONAL PARTS FS-SINAD OPTION

122	1	2805186	SINAD OPTION
123	2	7000A444-05	SCREW, MACH, PHIL, 4-40
124	2	7075088A	LKWSHR, INT. TOOTH FOR #4 SCREW
125	2	8552A125A	TEFLON WSHR, #4

REV	CHANGE	DATE	BY
B0	SEE ECR# 3067	3/30/15	VT
A26	SEE ECR #2914	12/19/14	MJF
A25	SEE ECR #2294	8/21/14	MJF
A24	SEE ECR# 1883	3/17/14	VT
A23	SEE ECR# 647	4/18/13	VT
A22	SEE ECR #1262	12/17/12	MAF
A21	SEE ECR #11-7709	4/18/11	MAF
A20	SEE ECR #09-5888	1/13/10	MAF

FINISH:	N/A
	REMOVE BURRS, SHARP CORNERS AND EDGES
MATERIAL:	N/A
UNIT OF MEASURE:	RF
NAME:	DCFCTBD W/OPTIONS

Tolerances Unless Otherwise Specified
Angles ----±0.5°
X.XX ------±0.015
X.XXX -----±0.005

SIGNAL DIVISION
Federal Signal Corporation
2645 FEDERAL SIGNAL DRIVE - UNIVERSITY PARK,IL 60466

DRAWN BY: SRG DATE: 4/29/02
CHKD BY: SC DATE: 4/29/02
SCALE AT D SIZE: NONE
DRAWING NUMBER: 8402147A